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ENVIRONMENTAL STATEMENT

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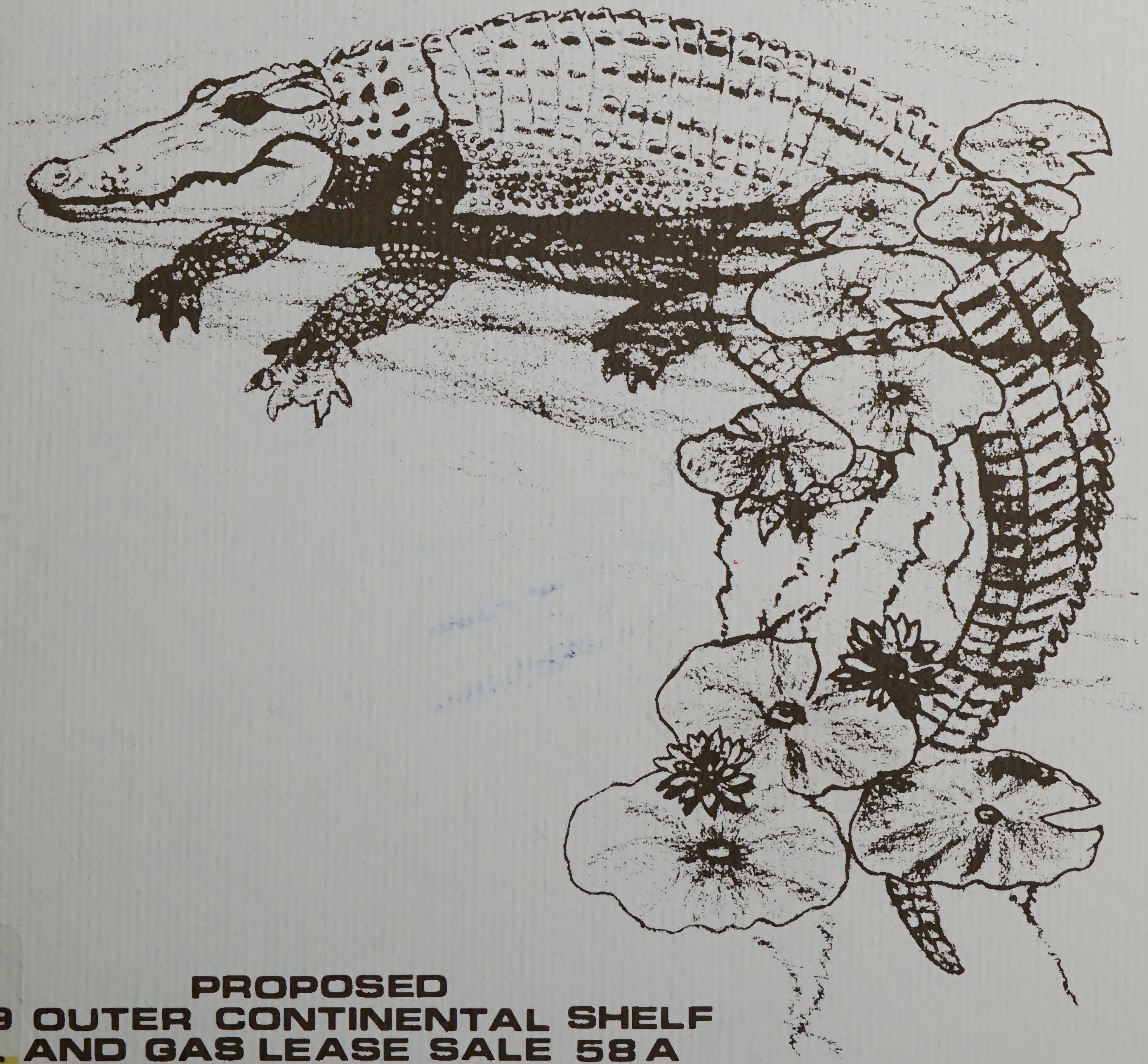

PROPOSED
1979 OUTER CONTINENTAL SHELF
OIL AND GAS LEASE SALE 58A

WESTERN AND CENTRAL
GULF OF MEXICO

VOLUME 1 OF 2

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT

NEW ORLEANS OUTER CONTINENTAL SHELF OFFICE
HALE BOGGS FEDERAL BUILDING
500 CAMP STREET—SUITE 841
NEW ORLEANS, LA. 70130

IN REPLY REFER TO
Sale 58A

June 29, 1979

Dear Sir or Madam:

Enclosed for your information is a copy of the final environmental statement (FES) prepared on the proposed Central and Western Gulf of Mexico Outer Continental Shelf Oil and Gas Lease Sale No. 58A. The sale is tentatively scheduled to be held in November 1979.

Lease offerings under consideration include 122 tracts offshore Texas, Louisiana, Mississippi, and Alabama. Tracts are summarized by location, acreage, distance from shore and water depth in Table 1, Volume 1. The tracts range from 6 to 203 kilometers from shore in water depths of 6 to 500 meters. The visuals referenced in the statement are enclosed as Volume 2.

The Bureau of Land Management has prepared this final environmental statement to fulfill its responsibilities under the National Environmental Policy Act of 1969. The statement is based upon information supplied by, and in consultation with, other Federal, state, and local agencies; oil and gas companies; interested private organizations and citizens; and comments received pertaining to the draft environmental statement, which was made available to the public on January 26, 1979.

Sincerely,

H. P. Sieverding
Acting Manager

Enclosures

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DEPARTMENT OF THE INTERIOR

FINAL

ENVIRONMENTAL STATEMENT

PROPOSED

1979 OUTER CONTINENTAL SHELF

OIL AND GAS LEASE SALE 58A

PREPARED BY

BUREAU OF LAND MANAGEMENT

DEPARTMENT OF THE INTERIOR

Frank Gregg

DIRECTOR
BUREAU OF LAND MANAGEMENT

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SUMMARY: PROPOSED OCS LEASE SALE 58A

Draft ( ) Final (x) Environmental Statement

Department of the Interior, Bureau of Land Management

1. Type of Action

Administrative (x) Legislative ( )

2. Brief Description of Action

This proposed oil and gas lease sale in the western and central Gulf of Mexico includes 122 tracts located on the Outer Continental Shelf in federal waters offshore of the States of Texas, Louisiana, Mississippi, and Alabama. These proposed tracts comprise approximately 582,529.75 acres ranging from 3-165 nautical miles (6-189 kilometers) from shore in water depths of 6-500 meters. Pending the Secretary of the Interior's decision, this proposed lease sale is tentatively scheduled for November, 1979.

3. Summary of Environmental Impacts

This proposed lease sale may result in incremental damage to localized marine and terrestrial biological organisms and habitats, air and water quality, cultural and recreational resources, commercial fishing, shipping and military operations, as a result of exploratory drilling, platform and pipeline construction, production drilling, and accidents.

4. Alternatives Considered

A. Modify the Sale
B. Withdraw the Sale
C. Delay the Sale

5. Comments Have Been Requested From the Following Federal Agencies

- Department of Commerce
  - National Oceanic and Atmospheric Administration
- Department of Defense
- Department of the Air Force
- Department of the Army
- Department of the Navy
- Department of Energy
  - Federal Energy Regulatory Commission
- Department of Health, Education, and Welfare
- Department of Housing and Urban Development
- Department of the Interior
  - Office of the Solicitor
  - Fish and Wildlife Service
  - National Park Service
  - Heritage Conservation and Recreation Service
  - Bureau of Mines
  - Geological Survey
- Department of Justice
- Department of State
- Department of Transportation
  - Coast Guard
  - Federal Aviation Administration
  - Materials Transportation Bureau
- Environmental Protection Agency
- Federal Communications Commission
- Federal Maritime Commission
- Federal Trade Commission
- Interstate Commerce Commission
- National Science Foundation
- National Transportation Safety Board
- Nuclear Regulatory Commission
- Advisory Council on Historic Preservation
- Marine Mammal Commission
- Gulf Regional Fishery Management Council
- Water Resources Council

State Agencies

- Alabama
  - Development Office
    - State Clearinghouse
  - Department of Conservation and Natural Resources
    - Geological Survey
  - Historical Commission
    - State Historic Preservation Officer
  - Coastal Area Board
- Louisiana
  - Department of Urban and Community Affairs
    - State Clearinghouse
  - Department of Culture, Recreation and Tourism
    - State Historic Preservation Officer
  - Department of Natural Resources
  - Department of Wildlife and Fisheries
  - Department of Transportation and Development
  - Council on Environmental Quality
- Mississippi
  - Office of the Governor
    - State Clearinghouse
  - Department of Archives and History
    - State Historic Preservation Officer
  - Natural Heritage Program
    - Marine Resources Council
- Texas
  - Office of the Governor
    - State Clearinghouse
    - Budget and Planning
  - Historical Commission
    - State Historic Preservation Officer
    - Antiquities Committee

Areawide Clearinghouses

- Alabama
  - South Alabama Regional Planning Commission
- Louisiana
  - Regional Planning Commission for Jefferson, Orleans, and St. Bernard Parishes
  - Acadiana Regional Clearinghouse
  - Southwest Regional Clearinghouse
  - Teche Regional Clearinghouse
  - Metropolitan Regional Clearinghouse
- Mississippi
  - Gulf Regional Planning Commission
  - South Mississippi Planning and Development District
- Texas
  - Southeast Texas Regional Planning Commission
  - Lower Rio Grande Valley Development Council
  - Coastal Bend Council of Governments
  - Houston-Galveston Area Council
  - Golden Crescent Council of Governments

6. Date Statement Made Available to EPA and the Public:

Draft Statement: January 26, 1979
Final Statement:

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Section I

Description Of The Proposal

A. Proposed Action

1. Location and Reserves

This proposed lease sale would provide for the orderly and timely development of oil and gas reserves expected to occur on tracts on the 122 Outer Continental Shelf (OCS) in federal waters in the Gulf of Mexico offshore of Texas, Louisiana, Mississippi, and Alabama (fig. 1). Table 1, Visual No. 1, and Overlay No. 1B provide a more detailed description and precise location of these tracts.

These 122 tracts include approximately 582,529.75 acres (ac) and range from 3 to 126 nautical miles (nmi) (6-203 kilometers (km)) from shore in water depths of 6 to 500 meters (m). Approximately 57 percent of these tracts are gas prone, 3 percent are oil prone, and 40 percent are both oil and gas prone.

Estimates based on conditional probabilities of the reserves of oil and gas that may be discovered as a result of this proposed sale include:

	Low	Mean	High
Oil (MMB)	21.6	39.5	59.8
Gas (MMMCF)	359.6	596.9	893.4

Source: U.S. Geological Survey, 1978.
Notes: (MMB) million barrels.
(MMMCF) billion cubic feet.

At peak production, the estimated daily production rates include:

	Low	Mean	High
Oil (BPD)	8,500	15,000	23,000
Gas (MMCFD)	140	240	350

Source: U.S. Geological Survey, 1978.
Notes: (BPD) barrels per day.
(MMCFD) million cubic feet per day.

Subsequent to the tract selection for proposed Sale No. 58A, and after preparation of the draft environmental statement, seven tracts were added to the proposed sale. The oil and gas resource estimates utilized do not reflect this addition and this statement does not specifically consider those tracts. However, a stipulation for one of the added tracts, tract 58A–118, is included and this tract is considered for deletion in an alternative to the proposal. The seven additional tracts have all been considered previously in environmental statements. Listed below are the additional tracts, with their Sale No. 58A designations, the environmental statement in which each was considered, and the tract designations used in the environmental statements.

Sale No. 58A tract No.	Previous environmental statement	Previous tract No.
58A–117	Sale No. 47 FES, filed w/EPA Feb. 17, 1977	47–20.
58A–116	Sale No. 51 FES, filed w/EPA July 20, 1978	51–19.
58A–118	do	51–54.
58A–119	do	51–100.
58A–120	do	51–105.
58A–121	do	51–130.
58A–122	do	51–133.

2. Geophysical Exploration

Surveys indicating seismic refraction, seismic reflection, gravity, magnetics, bright spot technology, and stratigraphic correlation are collected before and after leasing to assist in the determination, location, and magnitude of petroleum resources. Surface vessels of the 50 to 300 ton class are utilized to perform geophysical surveys. In general seismic surveys record the behavior of shock waves through various rock formations. This information is used to determine the presence of salt domes, folds, faults, and sediment thickness.

3. Development Assumptions

a. EXPLORATION

After a lease has been issued, shallow surveys defining geologic hazards, bottom stability, cultural resources and other conditions which might affect exploratory drill site locations are performed. Once a location has been selected, exploratory drilling begins. These drilling operations are basically the same regardless of the type of mobile rig utilized (jack-up rigs, drillships or semi-submersibles). Initially, a drive pipe is installed along with a blowout preventer. The actual drilling process involves the use of introduced muds which act as lubricants, coolants, and pressure controls. Cuttings or a mixture of mud and drilled materials are a product of the drilling process. Estimates of 60 to 160 exploratory wells may be drilled as a result of this action. Table 2 shows the anticipated development timeframe and table 3 shows the estimated development costs expected to result if this proposed sale is held.

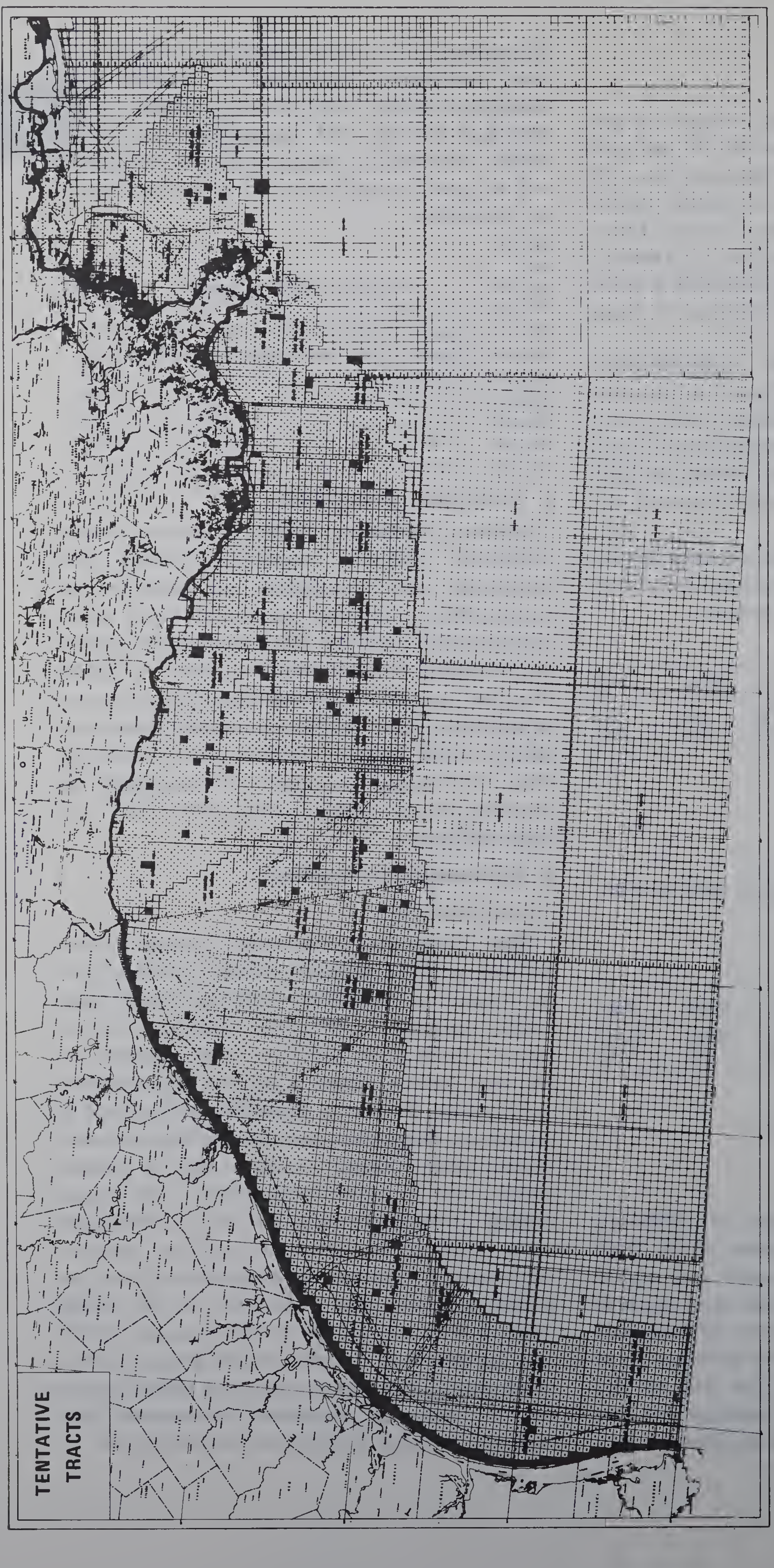


FIGURE 1
PROPOSED TRAC

Table 1

TENTATIVE TRACT LIST

Tract	Block	Description	Reserve	Water Depth (m)	Acreage	Distance from Shore nmi (km)
SOUTH PADRE ISLAND AREA, EAST ADDITION						
58A-1	A-43	All	G	78	5,760	43 (80)
58A-2	A-54	All	G	78	5,760	43 (80)
NORTH PADRE ISLAND AREA						
58A-3	947	All	G	36	5,760	17 (31)
58A-4	957	All	G	32	5,760	13 (24)
MUSTANG ISLAND AREA						
58A-5	759	All	G	50	5,760	27 (50)
MUSTANG ISLAND AREA, EAST ADDITION						
58A-6	A-84	All	G	85	5,760	39 (72)
MATAGORDA ISLAND AREA						
58A-7	566	All	G	23	5,760	13 (24)
58A-8	680	All	G	44	5,760	38 (70)
58A-9	698	All	G	26	5,760	23 (43)
58A-10	709	All	G	48	5,760	42 (78)
BRAZOS AREA, SOUTH ADDITION						
58A-11	A-78	All	G	50	5,760	37 (69)
58A-12	A-131	All	G	62	5,760	39 (72)
GALVESTON AREA						
58A-13	239	All	G	16	5,760	17 (31)
58A-14	240	All	G	18	5,760	16 (30)
58A-15	241	N½	G	18	2,880	14 (26)
58A-16	424	All	G	31	5,760	13 (24)
GALVESTON AREA, SOUTH ADDITION						
58A-17	A-128	All	G	50	5,760	56 (104)
HIGH ISLAND AREA						
58A-18	154	S½	G	15	2,880	16 (30)
HIGH ISLAND AREA, SOUTH ADDITION						
58A-19	A-495	All	G	70	5,760	80 (148)
58A-20	A-514	All	G	62	5,760	73 (135)
58A-21	A-515	All	G	62	5,760	74 (137)
58A-22	A-541	All	G	68	5,760	76 (141)

Table 1 (cont'd)

Tract	Block	Description	Reserve	Water Depth (m)	Acreage	Distance from Shore nmi (km)
HIGH ISLAND AREA, EAST ADDITION, SOUTH EXTENTION						
58A-23	A-346	All	G	80	5,760	87 (161)
SABINE PASS AREA						
58A-24	11	All	G	8	5,000	11 (20)
WEST CAMERON AREA						
58A-25	29	*	G	8	2,816.37	3 (6)
58A-26	30	*	-	-	-	- -
	31	*	G	9	1,405.70	3 (6)
58A-27	96	All	G	10	5,000	3 (6)
58A-28	113	All	G	10	5,000	13 (24)
58A-29	199	All	G	17	5,000	26 (48)
WEST CAMERON AREA, WEST ADDITION						
58A-30	393	All	G	24	5,000	55 (102)
58A-31	431	All	G	30	5,000	58 (107)
WEST CAMERON AREA, SOUTH ADDITION						
58A-32	446	All	G	35	5,000	65 (120)
58A-33	491	All	G	42	5,000	76 (141)
58A-34	575	All	G	65	5,000	87 (161)
58A-35	618	All	G	96	5,000	96 (178)
58A-36	631	All	G	102	5,000	101 (187)
58A-37	636	All	G	110	5,000	102 (189)
EAST CAMERON AREA						
58A-38	25	All	G	11	5,000	7 (13)
58A-39	90	All	G	18	5,000	19 (35)
58A-40	105	All	G	20	5,000	25 (46)
58A-41	130	All	G	23	5,000	31 (57)
EAST CAMERON AREA, SOUTH ADDITION						
58A-42	262	All	G	46	5,000	68 (126)
58A-43	329	All	G	76	5,000	84 (156)
VERMILION AREA						
58A-44	27	E½*	O&G	7	1,609.44	3 (6)
58A-45	59	All	G	12	5,000	14 (26)
58A-46	100	All	G	19	5,000	23 (43)
58A-47	112	All	G	15	4,958.96	26 (48)
SOUTH MARSH ISLAND AREA						
58A-48	18	All	O&G	25	5,000	35 (65)
58A-49	26	All	O&G	27	5,000	37 (69)

Table 1 (cont'd)

Tract	Block	Description	Reserve	Water Depth (m)	Acreage	Distance from Shore nmi (km)
VERMILION AREA, SOUTH ADDITION						
58A-50	273	All	O&G	53	5,000	104 (193)
58A-51	289	All	G	55	5,000	109 (202)
58A-52	311	All	G	61	4,273.11	71 (131)
58A-53	315	All	G	53	5,000	73 (135)
58A-54	381	All	G	104	5,000	88 (163)
SOUTH MARSH ISLAND AREA, SOUTH ADDITION						
58A-55	82	All	O&G	43	5,000	56 (104)
58A-56	83	All	O&G	44	5,000	56 (104)
58A-57	90	All	O&G	47	5,000	59 (109)
58A-58	91	All	O&G	47	5,000	58 (107)
58A-59	119	All	G	60	3,211.11	70 (130)
58A-60	123	All	G	60	5,000	65 (120)
58A-61	156	All	O&G	75	5,000	72 (133)
58A-62	157	All	O&G	75	5,000	71 (131)
SOUTH MARSH ISLAND AREA, NORTH ADDITION						
58A-63	238	**	O&G	6	4,463.70	10 (19)
58A-64	239	**	O&G	6	2,139.54	10 (19)
58A-65	240	All	O&G	7	3,327.87	12 (22)
58A-66	241	All	O&G	7	5,000	12 (22)
EUGENE ISLAND AREA						
58A-67	46	All	O&G	6	5,000	12 (22)
58A-68	49	All	O&G	6	5,000	15 (28)
58A-69	135	All	G	20	5,000	33 (61)
58A-70	155	All	G	23	5,000	36 (67)
EUGENE ISLAND AREA, SOUTH ADDITION						
58A-71	297	All	O&G	63	5,000	55 (102)
58A-72	303	All	O&G	67	5,000	56 (104)
58A-73	375	All	G	103	5,000	74 (137)
SHIP SHOAL AREA						
58A-74	133	All	G	11	5,000	22 (41)
58A-75	156	All	O&G	15	5,000	25 (46)
58A-76	157	All	O&G	14	5,000	24 (44)
58A-77	181	All	G	22	5,000	30 (56)
58A-78	189	All	G	22	5,000	30 (56)
SHIP SHOAL AREA, SOUTH ADDITION						
58A-79	245	All	O&G	48	5,000	43 (80)
58A-80	250	All	O&G	54	5,000	45 (83)
SOUTH PELTO AREA						
58A-81	1	*	O&G	9	1,568.02	4 (7)

Table 1 (cont'd)

Tract	Block	Description	Reserve	Water Depth (m)	Acreage	Distance from Shore nmi (km)
SOUTH TIMBALIER AREA						
58A-82	16	*	O&G	10	1,564.65	4 (7)
58A-83	25	All	O&G	18	2,148.46	8 (15)
58A-84	33	All	O&G	12	3,772.18	6 (11)
58A-85	170	All	O&G	29	5,000	30 (56)
SOUTH TIMBALIER AREA, SOUTH ADDITION						
58A-86	220	All	O&G	48	5,000	41 (76)
58A-87	245	All	O&G	56	5,000	44 (81)
58A-88	270	All	G	64	5,000	47 (87)
58A-89	300	All	O	108	4,480.52	54 (100)
WEST DELTA AREA						
58A-90	34	S½	O&G	24	2,500	10 (19)
58A-91	49	All	O&G	10	5,000	5 (9)
58A-92	76	All	O&G	52	5,000	12 (22)
58A-93	86	S½	O&G	56	2,500	6 (11)
58A-94	107	All	O&G	68	5,000	7 (13)
WEST DELTA AREA, SOUTH ADDITION						
58A-95	118	All	O&G	58	5,080.60	23 (43)
SOUTH PASS AREA						
58A-96	36	*	O&G	40	3,525.38	4 (7)
58A-97	39	*	O&G	20	619.17	4 (7)
58A-98	42	*	O&G	20	365.42	4 (7)
58A-99	43	*	O&G	40	4,217.26	4 (7)
SOUTH PASS AREA, SOUTH AND EAST ADDITION						
58A-100	68	All	O&G	120	5,000	10 (19)
58A-101	69	All	O&G	140	5,000	12 (22)
58A-102	73	All	O&G	135	5,000	9 (17)
MAIN PASS AREA						
58A-103	123	All	O&G	40	4,994.55	23 (43)
58A-104	143	All	O	60	4,994.55	17 (31)
58A-105	145	All	O	65	4,994.55	22 (41)
MAIN PASS AREA, SOUTH AND EAST ADDITION						
58A-106	303	All	O	73	4,999.96	17 (31)
EWING BANK						
58A-107	305	All	G	175	5,214.74	28 (52)
58A-108	306	All	G	190	2,459.43	29 (54)

Table 1 (concluded)

Tract	Block	Description	Reserve	Water Depth (m)	Acreage	Distance from Shore nmi (km)
VIOSCA KNOLL						
58A-109	989	All	O&G	350	5,760	22 (41)
58A-110	990	All	O&G	425	5,760	24 (44)
MISSISSIPPI CANYON						
58A-111	27	All	O&G	425	5,760	23 (43)
58A-112	28	All	O&G	500	5,760	25 (46)
58A-113	531	All	G	325	5,760	37 (69)
58A-114	575	All	G	350	5,760	39 (72)
HIGH ISLAND AREA, EAST ADDITION, SOUTH EXTENSION						
58A-115	A-374	All	G	115	5,760	102 (189)

Notes: * That portion of the lease block which is more than three geographical miles seaward from the line described in the supplemental decree of the U.S. Supreme Court, June 16, 1975 (United States vs. Louisiana, 422 U.S. 13).

** That portion of the lease block seaward of a line nine geographical miles from the Chapman Line.

G	gas
O	oil
O&G	oil and gas
(m)	meters
(nmi)	nautical mile

ADDENDUM*

Tract	Block	Description	Reserve	Water Depth (m)	Acreage	Distance from Shore nmi (km)
BRAZOS AREA						
58A-116	436	All	G	22	5,760	12 (23)
GALVESTON AREA						
58A-117	389	All	G	30	5,760	26 (48)
HIGH ISLAND AREA, EAST ADDITION, SOUTH EXTENSION						
58A-118	A-385	All	G	110	5,760	98 (182)
VERMILION AREA, SOUTH ADDITION						
58A-119	330	All	G	70	5,000	76 (142)

Addendum (cont'd)

Tract	Block	Description	Reserve	Water Depth (m)	Acreage	Distance from Shore nmi (km)
SOUTH MARSH ISLAND AREA, SOUTH ADDITION						
58A-120	75	All	G	43	5,000	54 (100)
MAIN PASS AREA						
58A-121	111	All	O&G	30	4,994.55	17 (32)
MAIN PASS AREA, SOUTH AND EAST ADDITION						
58A-122	312	All	O&G	75	4,999.96	12 (23)

NOTES: *These tracts were those for which high bids were rejected following the bid opening for Sale 51.

Table 2

Anticipated Development Timeframe

Low

	81	82	83	84	85	86	87	88	89	T
Wells										
Exploratory	5	10	15	15	15	-	-	-	-	60
Production	-	5	5	5	10	15	15	5	-	60
Platforms	-	1	1	2	2	2	2	-	-	10
Pipelines (mi)	-	-	100	-	-	-	-	-	-	100
Production (%)	-	-	-	-	-	-	-	-	-	-

Mean

	81	82	83	84	85	86	87	88	89	T
Wells										
Exploratory	10	20	30	25	25	-	-	-	-	110
Production	2	10	10	10	15	20	20	13	-	110
Platforms	1	2	2	3	3	3	3	3	-	17
Pipelines (mi)	-	50	100	-	-	-	-	-	-	150
Production (%)	2	10	20	30	40	50	70	90	100	100

High

	81	82	83	84	85	86	87	88	89	T
Wells										
Exploratory	20	30	50	30	30	-	-	-	-	160
Production	5	15	15	15	20	30	30	20	-	150
Platforms	2	3	3	4	4	4	5	-	-	25
Pipelines (mi)	-	100	100	-	-	-	-	-	-	200
Production (%)	-	-	-	-	-	-	-	-	-	-

Table 3

Estimated Development Costs
(1972 Dollars)

	Low (million dollars)	Mean (million dollars)	High (million dollars)
Wells			
Exploratory	87.0	159.0	232.0
Development	58.8	98.0	147.0
Platforms	60.0	102.0	150.0
Pipelines	60.0	90.0	120.0
Terminals and Support	-	1.15	3.0
TOTAL	255.8	450.15	652.0

B. DEVELOPMENT AND PRODUCTION

When petroleum discoveries are made and the extent of a field has been determined a plan of development is devised. As a result, 10 to 25 multi-well platforms may be established with the drilling of 60 to 150 production wells (table 4).

The production phase of OCS oil and gas operations consists of bringing the product to the surface and preparing it for transport. This phase of the operation may go on for as long as 20 years. Formation waters or reservoir brines are produced in the oil and gas production process.

C. TRANSPORTATION

The principal means of getting gas and oil resources in the Gulf of Mexico from production areas offshore to processing and storage locations onshore has been and will continue to be via pipelines. Additionally the labor force, equipment and supplies needed to service the various stages of offshore operations are transported by crewboats, barges and helicopters as a result of this proposed action. 100 to 200 miles (mi) of new pipeline may be laid. These lines would run from new production facilities offshore and connect with the existing pipeline system to onshore facilities. No new pipelines that come onshore are anticipated unless production occurs on the South Texas OCS as a result of this proposed sale which cannot be transported to existing pipeline systems. Should this happen, it is estimated that up to 2 new pipelines coming ashore could result.

D. TERMINATION

When a reservoir has been depleted to a level at which it cannot produce profitably, operations are terminated. According to industry estimates, with proper placement of wells and sufficient pipeline capacity, a gas reservoir could be drained in as little as 10 years. In contrast, some oil reservoirs have been producing for over 20 years.

OCS Orders issued by the U.S. Geological Survey require wells to be plugged, the casing severed adequately below the mudline, the platform removed, and all obstructions cleared from the area. Major trunklines may be used for future production from adjacent areas, but smaller lines would probably be abandoned in place. Abandonment of pipelines consists of flushing the lines of entrained hydrocarbons by water, disposing of the water onshore, and severing the ends below the mudline.

E. INDUSTRY DEEPWATER CAPABILITIES

As the need for new sources of oil and gas increases, the necessity for exploration in deeper and more hostile environments becomes inevitable. Oil and gas development in these environments will require the use of new equipment suitable for working at such depths; however, the major factor determining the ability to produce oil and gas in deep water is economics. At the present time, there is a surplus of deepwater drilling capability.

Exploitation of hydrocarbon reserves occurs in several stages: exploratory drilling; development drilling and establishment of production facilities; transportation of the products.

The rigs most commonly used for exploratory drilling are drill barges, jack-ups, semi-submersibles and drill ships. Drill barges are most commonly used in inland waters. Jack-up rigs are limited in water depth by the length of the legs. There are currently about 16 jack-ups capable of drilling in depths of 110–200 m. Semi-submersibles and drill ships are most commonly used for deep water drilling.

Semi-submersible drilling rigs, also known as column-stabilized drilling units, provide a much larger deck space than drill ships but offer substantially less storage capacity in terms of weight. This is due to the much smaller waterplane area of semi-submersibles as compared to drill ships. Semi-submersible vessels are quite stable; roll seldom exceeds 5° on a properly found vessel, even in the most severe seas. All but one of the semi-submersible drill units utilize conventional caternary mooring systems, which is one of the limiting factors in water depth capability. In moderate water depths, chain gives a better catenary action, but in water depths greater than about 365 meters, weight makes it difficult to accomodate and carry abroad sufficient chain. In such cases, a chain and wire rope system is used. Dynamic positioning is much more advantageous in deep water. Only one semi-submersible rig, the SEDCO 709, has a dynamic positioning system. It also has more horsepower than any other drill vessel (approximately 26,000 to 30,000 HP). At present, there are approximately eight semi-submersibles capable of drilling in water depths of 450–610 m and only two are capable of operating in depths of 610–760 m.

One drill ship, GLOMAR CHALLENGER, is capable of drilling in any water depth. The

Table 4

Summary of Activities

	Low	Mean	High
Lease Area (AC)	-	545,255	-
Onshore Facilities (AC)	-	-	40
Pipeline R/W*			
Onshore (AC)	-	-	-
Offshore (AC)	2,424	3,636	4,848
Wells			
Exploratory	60	110	160
Production	60	110	150
Platforms	10	17	25
Pipelines (MI)	100	150	200
Storage Facilities	-	-	2
Estimated Reserves			
Oil (MB)	21.6	39.5	59.8
Gas (MMCF)	359.6	596.9	893.4
Peak Production			
Oil (BPD)	8,500	15,000	23,000
Gas (MMCFD)	140	240	350
Transportation			
Oil (BPD)			
Tanker	-	-	-
Pipeline	8,500	15,000	23,000
Drilling Muds**			
Muds (T)	-	-	71,300
Cuttings (T)	-	-	211,420
Formation Waters***			
Peak (BPD)	5,100	9,000	13,800
Total (MMB)	12.9	23.7	35.8

NOTES: *Average pipeline R/W 200 ft. wide.

**Drilling muds determined from average depth of well - 10,000 ft., cuttings - 682 (T) per well, muds - 230 (T) per well.

***Formation waters determined from average - .6 barrel of formation water produced for each barrel of oil and condensate.

(AC)	acre	(BPD)	barrels per day
(MI)	mile	(MMCFD)	million cubic feet per day
(MMB)	million barrels		
(MMCFD)	billion cubic feet	(T)	ton

GLOMAR CHALLENGER, however, is involved with scientific sampling and purposely avoids any potential oil and/or gas prone areas. Other drill ships, such as the DISCOVERER 534, DISCOVERER SEVEN SEAS, and NEDDRILL 2, are designed to drill in waters up to 1,829 m deep. Most of these vessels utilize a dynamic positioning system, although some have mooring systems as well.

Due to the greater load capacity resulting from the greater waterplane area of the hull, drillships in general have greater capabilities for drilling in deeper water. For deep drilling from a floating vessel, the blow-out preventer stack and well controls must be placed on the seafloor. Under threat of inclement weather, or in other emergencies, the entire riser string must be disconnected at the seafloor, retrieved and laid down on deck. This procedure necessitates the retrieval of all drilling mud in the riser. Most drill ships have a mud storage capacity of around 4,000 barrels, whereas most semi-submersible vessels have only a 1,200-1,500 barrel capacity.

Floating drill units make up about 50 percent of today's mobile offshore fleet. Drilling from a floating platform is very different from drilling on a bottom-supported platform or onshore, and requires some very specialized equipment. In any type of drilling, the ability to keep a constant preselected weight on the drill bit is extremely important. To counteract the up and down movement of waves, all floating units have some sort of heave compensator. These units are attached to the traveling block or crown block and through the use of high pressure air or air/oil, the loads caused by the rise and fall of the vessel are balanced out (fig. 1).

Additional problems are posed by the riser system in a floating drilling operation since it too must also allow for the up and down movement of the waves. This problem is mitigated through the use of slip-joints in the riser itself and a riser tensioning system which operates similarly to the heave compensator previously described. Guidelines leading to the subsea blow-out preventor and wellhead also have similar tensioning systems.

When drilling in deep water, the riser itself presents some special problems. The riser is connected to the subsea wellhead through a ball-joint, which allows up to 5° of angular movement of the riser with respect to the wellhead. In general, operations are terminated if the ball-joint angle exceeds 3.5°. In deep water, the marine riser must support the column of heavy drill mud inside it, and therefore very strong and heavy pipe is required. Part of the weight is supported by the blowout preventor assembly and its foundation piles. Much of it may also be supported by the riser tensioner system and by the use of special flotation elements placed around the riser.

Another piece of equipment common to floating rigs is the traveling block guide rails and dolly. This equipment keeps the traveling block, which hangs from the crown block on the derrick, centered over the rotary table and the hole. In addition, floating rigs generally have power-assisted pipe racking while bottom supported rigs do not.

As technology advances, deep water exploration drilling records are being broken almost yearly. In 1969, Exxon drilled several wells in waters deeper than 300 m, one of which was in almost 400 m of water off California. IN 1970, Exxon drilled another well off California in 456 m. Shell, in 1974, broke Exxon's record with a well drilled off Gabon in some 633 m of water. Shell drilled another well in the same area at a depth of 698 m in 1975. Then in 1976, the depth record was extended to 1,055 m by Esso Exploration off Thailand. In 1977, Esso Exploration broke their own depth record with a well drilled off Surinam in 1,204 m. Getty, as operator for the Seagap Group and Hydro-Congo, extended the depth record to 1,325 m off the coast of Congo in 1978. Again in 1979, Getty has established a new record with a well in the Mediterranean off Barcelona, Spain, in 1,353 m using the drillship DISCOVERER SEVEN SEAS. Getty's record should not stand for long. On June 1, 1979, Texaco, along with Petro-Canada, Hudson's Bay Oil & Gas Co., Ltd., Home Oil Co., Ltd., and Dome Petroleum, Ltd., are scheduled to spud an exploration well in 1,500 m of water approximately 300 km northeast of St. John's, Newfoundland. They, also, will be using the DISCOVERER SEVEN SEAS.

The limiting factor in the exploration of hydrocarbon reserves in deep water is not in drilling, but in completion and production. Subsea completions are necessary in water depths that are not accessible from conventional platforms. Subsea completions also augment conventional platforms by: 1) developing parts of smaller structures and allowing gas or water injection in the periphery of a structure; 2) allowing the development of fields not economically viable with a conventional platform; and 3) providing early production allowing improved initial cash flow.

The first known underwater completion in North America was made in 1943 in Lake Erie. Since then over 300 subsea completions have been made in Lake Erie in less than 26 m of water. Subsea production technology has been under development since the early 1960's in the Gulf of Mexico. These wells are controlled by hydraulic or electrohydraulic systems, serviced with pressure activated tools through the flowline, and have downhole automatic shut-in systems. Between 1960 and 1974, 106 subsea completions were made worldwide.

In completing most of these wells, the equipment used required divers. The current working depth limit for a diver is approximately 460 m, and this requires 12-14 hours to pressurize the diver to depth. The diver is allowed three hours lock-out working time. About 10 days are required for decompression. Depending on the individual, 30 days can be spent pressurizing, working and decompressing. This procedure is very expensive and time consuming.

In order to reduce the need for divers, techniques have been developed for installation of subsea completions from surface vessels and submersibles. There are currently two types of subsea completions now in use. The first type consists of the wellhead standing on or below the ocean floor on a template called a wet tree (fig. 2). The second system consists of a well head enclosed in a chamber at one atmosphere of pressure (fig. 3). The chamber allows a man to work on the well in a shirt sleeve environment. The advantage of the dry completion is that well control lines and the flowline can be connected from inside the chamber. The wet tree requires connections to be made on the outside by a diver, submersible, or a surface guide line; a costly proposition in deep water. The depth of water is not a critical factor in the dry completion because the wall thickness of the chamber can be increased to withstand greater pressures. According to one industry expert the current limit to operating depths without divers is the ability to service the installation and the completion from surface vessels. Lockheed can service to 365 m with a tethered submersible. The development of umbilical cables to depths of 610 m is underway. The world record for commercial wellhead completion is now claimed by Lockheed Petroleum Services, Ltd. when they placed a one-atmosphere subsea wellhead at a depth of 164 m in the Namorado Field offshore Rio de Janiero, Brazil.

Wet tree completions have been installed and are in production in various parts of the world. One system, shown in figure 2, is in use in the Casablanca Field in the Mediterranean Sea south of Barcelona, Spain, in 120-150 m of water. The system is designed for diverless installation with manipulator back-up. The installation of this system was accomplished without diver assistance. A tubing head adapter with four guide posts was lowered down the four guidelines attached to the existing subsea wellhead. This unit was then locked into place hydraulically and pressure tested. Then, a modified blow-out preventer stack was lowered on the guidelines and was guided into position by the guide posts. It was then locked down onto the tubing head adapter with hydraulics. At this point, the tubing hanger, downhole equipment, and well tubing were installed and the well was temporarily plugged. The blow-out preventer was then removed and the Christmas tree (wellhead) assembly was run, landed and locked into place and tested. A lower riser package containing hydraulically-operated completion and workover controls was used to attach the Christmas tree assembly, and after the assembly was in place, the lower riser package was retrieved. A flowline pull-in tool and lockdown frame were then lowered and locked into place on two of the guide posts. The flowlines were connected to a "sled" which was attached to wire ropes from the pull-in tool and the sled, with the flowlines, was pulled into position in the lockdown frame. Hydraulically-actuated wedges were driven home locking the sled to the lockdown frame. The wires were cut off remotely and the pull-in tool was retrieved. The lower riser package was re-lowered and locked into place on top of the Christmas tree. Flowline connectors are extended, locked and pressure tested. Both tubing plugs were pulled and the well was brought into production and cleaned up. When servicing is required, a pop-up buoy is remotely released. The design lifetime for the system is 20 years. With the exception of the control system, the unit may be left on the seafloor for 20 years. The control cap is designed for a service interval of five years. Several systems are also in production in the North Sea.

Seal-Comex, a service company, is currenty conducting an economic study for Mobil Oil Corporation for installation of a subsea production system in the East Breaks Area, offshore Texas. This Maniford Center has been tested for four years and is now being considered for installation in water depths of 305–365 m.

Cameron Iron Works began development work on a non-guideline drilling system in 1972 and has delivered systems for work in 915 m. New designs and concepts have produced a system capable of drilling in depths of 1,525 m.

In October 1974, Exxon installed a Subsea Production System 27 mi southeast of Grand Isle, Louisiana, in 52 m of water. The system was installed, controlled and operated remotely utilizing equipment and diverless techniques suitable for producing oil and gas in water depths of approximately 600 m. A major component of the system is called a maintenance manipulator. When needed, this robot can be lowered to the template and moves around the unit on a track. The manipulator has a system of underwater television cameras built in so the operator on the surface can control its movements. Initial production began in February 1977. This system represents the greatest advance of subsea production technology.

Subsea completions are designed for installation in at least 600 m of water. Deeper designs could be perfected if needed. However, when production from deep-water completions is realized, a means of transportation must be provided. Two choices are available: hydrocarbons may be piped to the surface and transported by tankers to land-based facilities or they may be transmitted by pipelines all the way.

ETPM has developed a method for laying pipe up to 42-in diameter in 1,000 m of water. This method is called RAT for *Remorquage* (towing), *Aboutage* (connecting) and *Tension*. Strings up to 1,000 m long are assembled on shore and fitted with buoyancy tanks. The strings are then towed to the laying site and connected by passing over a special dynamically positioned lay barge. They are then laid in a conventional manner. The method has been tested in the North Sea laying 42-in pipe in 250 m of water.

Santa Fe Engineering and Construction Company is constructing the first reel-type pipelaying ship, *Apache*, scheduled to begin work May 1, 1979. The pipe is welded together on shore, spooled onto a large reel, and rolled off at the site. The *Apache* will be able to hold up to 50.5 mi of 4-in pipe, 5.7 mi of 16-in pipe, or various sizes in between. It will be able to lay 16-in pipe, or various sizes in between. It will be able to lay 16-in pipe in water depths around 610 m and smaller lines in water depths of 915 m. With smaller portable reels, it can lay a bundle of several pipes at one time. Conventional and semi-submersible lay barges are in operation in depths of more than 610 m.

Research is currently underway on the design of pipeline and pipe-laying equipment, with special emphasis on how best to lay the pipe up to 30-in diameter in depths to 1,830 m.

If production is brought to the surface for shipment by tanker, special treatment and handling equipment may be required and some type of platform may be necessary at the site.

In shallow waters, conventional platforms have become the industry standard for production. From these platforms a number of wells are typically drilled and the well head completions are on the platform and not on the seafloor. The maximum depth to date for the installation of a conventional platform is 312 m by Shell Oil Company's 46,000 ton Cognac platform 24 km south of the mouth of the Mississippi River. The platform stands 386 m above the seafloor and 73 m above the surface of the ocean. It will have a record 62 wells. The base section was installed during the summer and fall of 1977. The other two sections were installed in the summer of 1978. Initial production is to begin in 1979.

In an effort to reduce the amount of steel required, and thereby the price, Exxon, as well as Mobil, Union and Amoco, are actively involved in designing a guyed tower for use in 300-m water depths (fig. 4). This structure would be bottom-supported and held upright by 16 guys, four at each corner. Moorings are designed for the life of the structure (a minimum of 20 years). The deck of the structure would be able to move up to 40% of the wave displacement (2 to 3 m in a storm). In October 1975, Exxon installed a one-fifth scale model of a guyed tower in 100 m of water off Grand Isle, Louisiana. The tower was highly instrumented and over two years of data confirm that the guyed tower is a feasible and practical platform concept for water depths of 22 to 600 m.

Another concept in production facilities for deep water is the tension leg platform (TLP) (fig.

5). The TLP is a floating structure which is held down by essentially vertical tension members which remain in tension regardless of cyclic loads due to current, wind and waves. This design is a compliant structure; it is able to move with waves and currents to a tolerable extent. In 1975, Deep Oil Technology, Inc., installed a prototype instrumented TLP in some 60 m of water off California. The TLP will soon be tested with suspended risers as a one-third scale model at a water depth of 200 m. Conoco and Amoco will be the first to install a TLP production system when they place their design in 189 m in the North Sea.

Semi-submersible drill rigs have also been used as floating production platforms. In June of 1975, the Hamilton Brothers first produced oil from their Argyll Field in the United Kingdom Sector of the North Sea using the converted semi-sub TRANSWORLD 58 connected to a seafloor manifold and anchor base by a composite riser. Six satellite subsea-completed wells currently produce to the subsea manifold in 79 m of water. After on-board processing, the gas is flared and crude is pumped back down the composite riser and to a single buoy mooring system nearby for shipment by tanker. There are currently about 150 semi-submersible units worldwide. Of these, approximately 18 have been converted to other uses, including three for oil production.

Although drilling riser technology, subsea completion technology and floating platform technology have been recently extended to beyond 1,000 m, production risers along with remote flowline connectors, represent the critical development component associated with deep water production systems. The deepest floating production riser system presently in service is that of the Argyll Field in some 76 m. The composite riser in the Argyll Field is vessel-supported and consists of a central structural riser surrounded by a number of smaller independent satellite risers. The central riser, which in this case carries the low pressure crude to the seafloor and then to a single point mooring for shipment, is designed to withstand the axial and flexural stresses generated by tension, wave action, vessel offset and current. This structural riser would also be the one to receive the buoyancy nodules in deeper water. The satellite risers would also need buoyancy nodules in very deep water. There is little doubt that a vessel-supported composite riser system could be designed to operate in 1,000 m. A major question, however, is whether the proportion of time that wells would be shut-in would be economically acceptable. The avoidance of frequent shutting-in of production during inclement weather would require specialized facilities. Furthermore, re-entry of the riser into the subsea manifold would present complex problems in the deep environment.

Another concept for improving production efficiency and re-entry in water depths greater than 365 m is the free standing composite riser (fig. 6). This system consists of a composite riser fitted with a buoyancy element to provide necessary support to the riser in the disconnect mode, and a remote connect/disconnect stab located at a depth of approximately 100 m in order to put it below the wave action but still within reach of divers. Guidelines from the buoyancy element at the top of the riser to the surface vessel would facilitate a diverless connection.

Another riser system which offers an extremely bright outlook for future deepwater production is the articulated riser system used for Exxon's Submerged Production System (SPS). This riser, along with the system, has been under test since 1975 in the Gulf of Mexico. The system consists of a base on the seafloor to which all the flowlines run. The lower 300 m (for a system designed for 500 m) consists of a tension member which also provides a housing for the flowlines and which is supported by a buoyancy element. Unlike the free standing composite riser, there is no provision for an emergency disconnect at the buoyancy chamber level. The SPS riser is designed to withstand maximum sea states and currents and remain connected. The upper 200 m consists of two 100+ m long sections joined in the middle and at each end by three articulated joints. At the surface, the articulated joint is attached to a surface mooring buoy with a permanent yoke attached to a production vessel, probably a converted tanker. The surface mooring buoy locates and supports the upper end of the riser. Each segment has adjustable buoyancy to provide the desired support. Exxon feels that this system would be operable in depths to 1,000 m.

The fourth system, designed by Deep Oil Technology, Inc., is for use with a tension leg platform. This system consists of individual risers specifically designed to take advantage of the inherent stability of the tension leg platform. The platform and risers would be designed to withstand maximum environmental conditions without the need to disconnect the risers. The upper termination of the risers is on the cellar deck level of the platform where the production tree and wing valve block (wellhead) is located, much like a conventional platform.

To be viable, deep water production systems must relinquish dependence on diver assistance and convert to automated techniques. Man's diving capabilities in deep water are quite limited. Although submersible vessels exist that provide a 1-atmosphere environment for man to any depth, his ability to perform mechanical tasks remotely is limited. For such tasks, divers are required. The French diving company, COMEX, set a new open ocean deep-diving record in October 1977 in the Mediterranean off the south of France. COMEX and French Navy divers were saturated in a chamber to a depth of 430 m. They were lowered to that depth and made a total of 10 hours of working dives during which they made an 8-in pipeline connection. Two divers, one from COMEX and one from the French Navy, made two 10-minute bounce dives to a record depth of 501 m. Decompression time from 430 m to the end of saturation was just over seven days and 17 hours.

In summary, oil and gas operations in ever greater water depths require the use of new and more economical production systems. Subsea completion technology is being tested in shallow depths to provide procedures to be used in very deep water. All industry experts agree that if given the necessary economic incentives, the technology will be available. A secondary result of subsea completion technology is the ability to develop small reservoirs without the expenditures required for a surface structure. As the price of oil increases on the world market, the feasibility to utilize more sophisticated production systems will be realized.

The capability for deep-water drilling has been in existence for several years and, in fact, a surplus of that capability is expected to continue for several more years. The deep wells drilled in the next several years will probably be drilled by a dozen major oil companies in order to meet lease or concession obligations. Production riser technology is the limiting factor in our ability to exploit reserves of hydrocarbons occuring in deep water. Before that exploitation can take place, the price of oil will have to increase significantly in order to make it economically feasible.

B. Leasing Process

1. Legal and Administrative Background

In accordance with the provisions of the Outer Continental Shelf Lands Act, as amended, the Department of the Interior is charged with administering mineral development on the Outer Continental Shelf (OCS). In the case of oil and gas development, this involves selection of areas for leasing, supervision of geological and geophysical exploration, environmental protection, resource evaluation in determining the sale price, conducting competitive bidding for the resources, as well as supervision of exploratory drilling and production activities on awarded leases. These activities are carried out primarily by two agencies of the Department—the Bureau of Land Management (BLM) and the Geological Survey (GS). Assistance from other agencies in the Department is provided as appropriate.

The BLM is responsible for implementing the leasing objectives of the Act. The Bureau performs its marine minerals leasing functions within the national goals of: 1) orderly and timely resource development, 2) protection of the environment, and 3) receipt of fair return.

The GS is responsible for providing resource estimates to the BLM during the presale evaluation, as well as implementing the developmental objectives of the Act. The Survey performs its operational functions for supervising and regulating exploration, development, and production activities after leases are issued.

The Survey has issued 14 OCS orders for the Gulf of Mexico (Appendix B). In the near future, the proposed national OCS orders will be withdrawn and revised area (Gulf of Mexico) orders will be issued for public review and comment. These revised area orders will incorporate public comments solicited during the review of the proposed National Orders.

The Department's OCS leasing program consists of nine major components:

1) Proposed OCS Planning Schedule
2) Resource reports from appropriate Federal agencies
3) Call for Nominations and Comments
4) Tentative Tract Selection
5) Environmental Analysis
6) Secretarial Issue Document
7) Pre-sale Evaluation
8) Lease Sale
9) Post-sale Analysis

The proposed OCS planning schedule (fig. I-8) was developed by the Department to assist state and local governments, industry, and the general public in planning for proposed OCS oil and gas activities; however, it does not represent a decision to lease. This proposed schedule is a planning tool used to determine the timing of individual sale procedures. Section 18 of the OCS Lands Act, as amended (43 U.S.C. 1331), requires that a five year leasing program which describes the size, timing, and location of leasing activities be submitted to Congress, the Attorney General, and the Governors by June of 1979. This program is to be prepared in consultation with affected States and Federal agencies and must be in place within 18 months of the date the amendments to the OCSLA were enacted (no later than March 1980). Annual review of the approved program is required. Improved resource and environmental data are continually acquired and analyzed. These data, along with the leasing objectives, current energy situation, availability of technology, and proximity of resources to market are considered in developing the schedule. The leasing objectives constitute the Department's policy for the OCS program and the consideration accorded to each varies from one leasing component to another.

An analysis is made in broad terms of when and where potential oil and gas areas should be proposed for leasing. This is done through a review of the national energy situation and the identification of future supply-demand imbalances. Deficits are identified by matching projections of future non-OCS supplies of oil and gas and future OCS production from existing leases with future projected demand.

The different options are also reviewed from the perspective of receipt of fair return. The size and frequency of sales can influence a competitive market, which in turn, affects the Government's receipt of fair return. Sufficient acreage is offered in each area to ensure that if major structures containing oil and gas are located, they will be explored diligently.

Section 8(a) of the OCS Land Act (43 U.S.C. 1334), as amended, provides for new bidding elements including a fixed or variable net profit share and a work commitment along with combinations of these and familiar cash bonus royalty systems. Only one bid variable per bidding system is allowed. New bidding systems must be implemented by regulations issued by DOE. Systems other than cash bonus bidding must be used for not less than 20 percent, nor more than 60 percent of the total area offered for lease each year. DOE must submit an annual report to Congress on the bidding system used.

Before leases are issued, the Attorney General, in consultation with the Federal Trade Commission, may conduct a thirty-day review of the sale results for possible effects on competition. (Section 8(c).)

The Department is required to consult with the other agencies in many post sale activities such as suspension and cancellation of leases (DOE), assignments (Attorney General), and pipeline right-of-way (FERC/DOE). (Sections 5(a), 8(e), and 5(e)-(f) respectively.)

2. Relationship to Existing and Proposed Oil and Gas Development

The development of oil and gas resources in the Gulf of Mexico began in 1938 with the discovery of the Creole field. This first successful venture into open water was located 1.3 nmi from shore in 8 m of water. In November, 1947, the first well to be drilled from a mobile platform out of sight of land was located 10.4 nmi from shore in 5 5 m of water in Ship Shoal Block 32.

From this early beginning, technology has advanced to the stage that production platforms in the Gulf are operating in water depths of 400 m; while current leases are active in water depths of 500 m. Since 1938, 12,534 wells have been drilled in the Gulf.

Since 1953 and enactment of the Outer Continental Shelf Land Act, the Bureau has leased approximately 13,357,292 ac. Currently, there are approximately 8,145,739 acres under active lease in the Gulf (table 5, figs. 9 and 10). In accordance with the provision of 43 Code of Federal Regulations (CFR) 2883, the BLM has granted 541 permits for 6,187 miles of rights-of-way for pipelines for the transportation of oil and gas from the OCS since 1956. An estimate of the production and facilities that may result from this proposed sale, as well as projections of OCS activity in the Gulf to 1984 are presented in table 6.

3. Environmental Studies Program

The OCS Lands Act (43 U.S.C. 1334), as amended, provides that studies are required for OCS lease sale areas to establish information for assessment of the impact of oil and gas development on human, marine and coastal environments.

FIGURE 8 PROPOSED SCHEDULE

PROPOSED OCS PLANNING SCHEDULE

August 1977

SALE AREA	1977					1978												1979												1980												1981											
	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Cl. Cook Inlet ||N|S|																																																			
42 N. Atlantic	F		P		N	S																																														
43 South Atlantic Georgia Embayment			F		P		N	S																																												
45 Gulf of Mexico				F		P		N	S																																											
65 Eastern Gulf of Mexico						E		H			F	P		N	S																																								
51 Gulf of Mexico							E		H			F		P		N	S																																						
49 Mid-Atlantic		T						E		H			F			P		N	S																																				
48 Southern California													E		H			F		P		N	S																														
58 Gulf of Mexico			C		D		T							E		H			F		P		N	S																														
58A Gulf of Mexico		C				D			T									E		H			F		P		N	S																										
Federal/State Beaufort (near shore)			C		D				T											E		H			F			N	S																								
55 Gulf of Alaska										C		D			T										E		H			F		P		N	S																		
62 Gulf of Mexico														C		D			T								E		H			F		P		N	S																
46 Kodiak																													E		H			F		P		N	S														
52 North Atlantic																C		D			T								E		H				F		P		N	S														
53 Central and Northern California				C							D			T																			E		H			F		P		N	S										
60 Cook Inlet																	C		D			T										E				H				F		P		N	S									
56 South Atlantic Georgia Embayment																				C		D			T										E		H			F		P		N	S								
59 Mid-Atlantic																										C		D			T								E		H			F		P		N	S				
66 Gulf of Mexico																												C		D			T							E		H			F		P		N	S			
57 Bering Norton																					C							D			T										E		H					F		P		N	S

C - Call for Nominations
D - Nominations Due
T - Announcement of Tracts
E - Draft Environmental Statement
S - Sale

H - Public Hearing
F - Final Environmental Statement
P - Proposed Notice of Sale
N - Notice of Sale

THE DEPARTMENT OF THE INTERIOR

Table 5

GULF OF MEXICO
OCS LEASING STATISTICS

	Leases Issued	Rel. or Expired	Active Leases	Acreage Issued	Acreage Under Lease
(10-19-73)					
Texas	310	169	141	1,554,666.11	719,187.41
Louisiana	1,316	508	810	5,580,793.90	3,460,023.26
Total	1,626	677	951	7,135,460.01	4,179,210.67
(9-4-74)					
Texas	515	266	247	2,298,120.77	1,301,552.07
Louisiana	1,686	638	1,047	7,046,674.31	4,538,053.70
MAFLA	87	0	87	485,396.89	485,396.89
Total	2,288	904	1,381	9,830,191.97	6,325,002.66
(6-9-75)					
Texas	637	271	364	2,976,546.10	1,952,572.99
Louisiana	1,908	656	1,246	8,079,862.90	5,471,380.18
MAFLA	87	0	87	485,396.89	485,396.89
Total	2,632	927	1,697	11,541,805.89	7,909,350.06
(12-29-76)					
Texas	676	278	396	3,186,880.14	2,122,587.03
Louisiana	2,008	731	1,272	8,522,202.27	5,576,138.97
MAFLA	91	18	73	508,436.89	404,756.89
Total	2,775	1,027	1,741	12,217,519.30	8,103,482.89
(11-9-77)					
Texas	707	289	417	3,214,324.23	2,108,181.12
Louisiana	2,107	786	1,314	8,978,245.71	5,730,299.91
MAFLA	114	45	69	640,916.89	381,716.89
Total	2,928	1,120	1,800	12,833,486.83	8,220,197.92
(8-18-78)					
Texas	740	306	433	3,525,820.76	2,321,757.65
Louisiana	2,164	888	1,269	9,240,495.27	5,534,424.82
MAFLA	114	61	53	640,916.89	289,556.89
Total	3,018	1,255	1,755	13,407,232.92	8,145,739.36

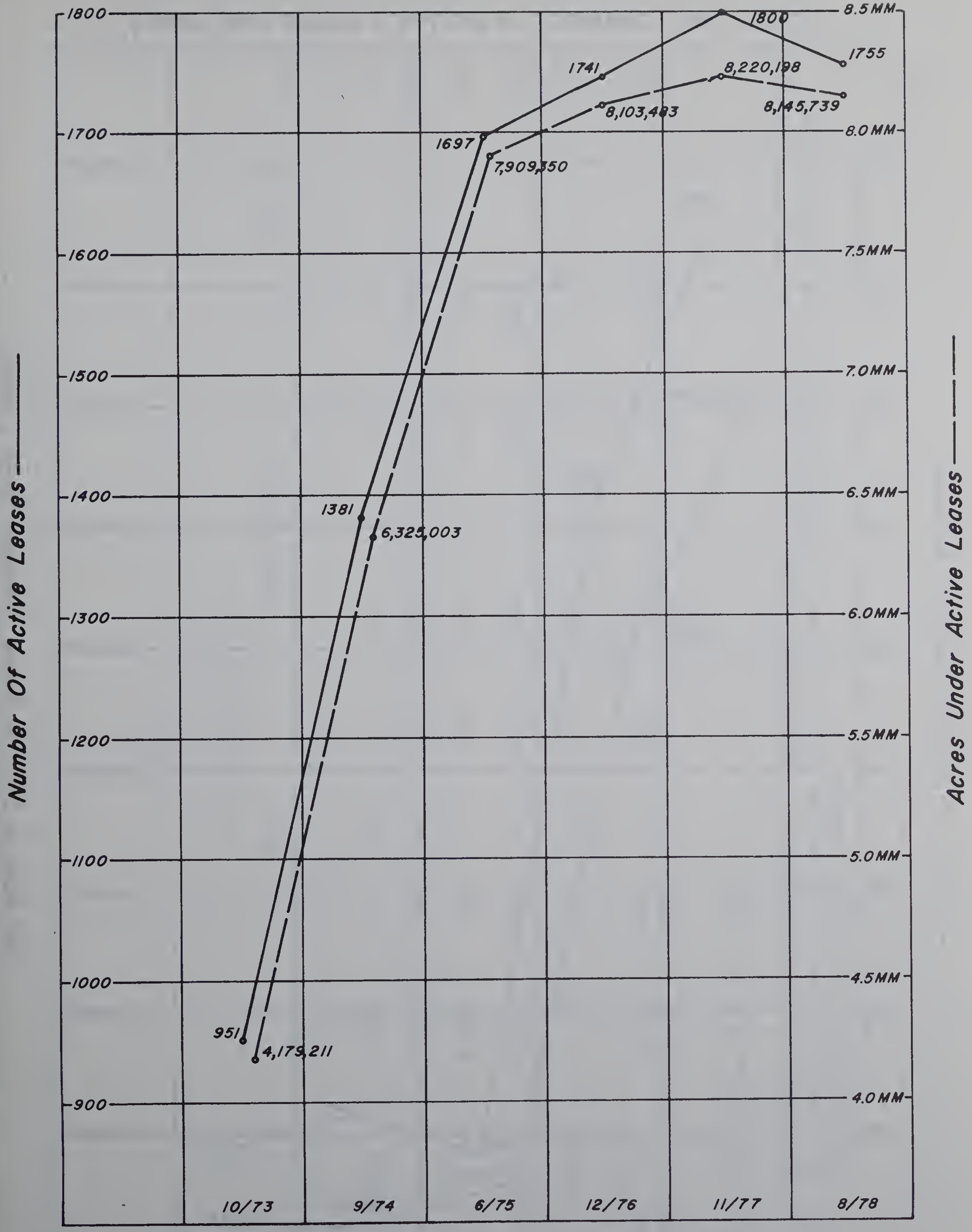


FIGURE 9
CUMULATIVE NUMBER
ACTIVE LEASES AND ACRES

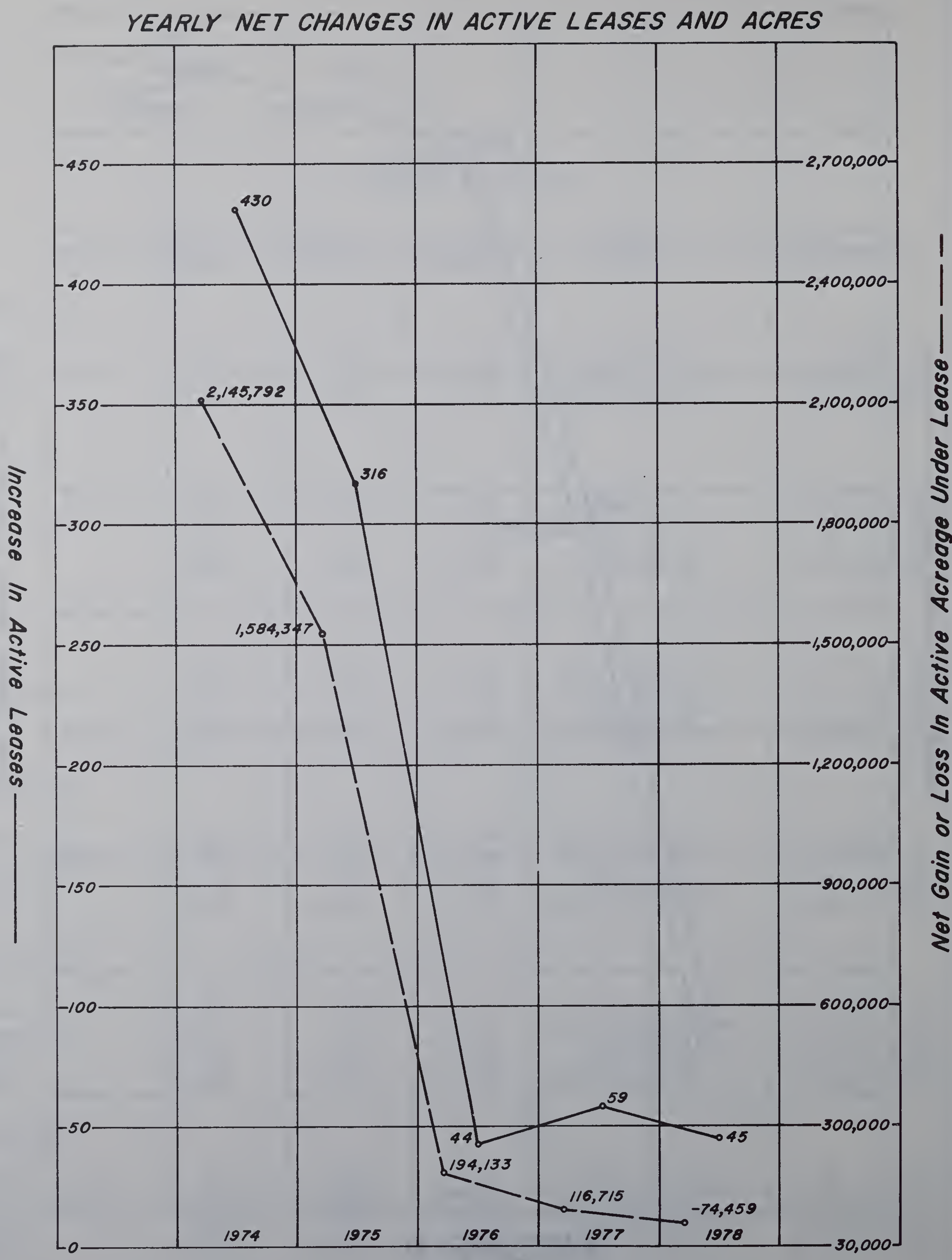


FIGURE 10
ANNUAL NET CHANGE ACTIVE LEASES AND ACRES

Table 6

OCS LEASING PROGRAM

		58A*			Projection **		1984 ***	
	1978	L		H	L	H	L	H
Lease Area (MAC)	7.95		.215		.4	1.0	7	10
Wells	15,030	60	-	150	1,500	3,000	16,000	18,000
Platforms	2,250	10	-	25	100	300	2,300	2,600
Pipelines (mi)	9,919	100	-	200	500	1,000	10,000	11,000
Storage Facilities	55	0	-	2	6	10	60	70
Estimated Reserves								
Oil (MMB)	2.50	.022	-	.060	.3	.9	2.0	3.5
Gas (MMMCF)	31.50	.360	-	.894	4.0	8.0	20.0	40.0

Source: U.S. Geological Survey, 1978.

Notes:
* It is expected that 40 percent of the acreage offered in this proposed sale would be leased.
** This projection is for the entire period of lease of leases expected to be issued during this five-year (1979-1984) period.
*** It is expected that some leases would have expired or been relinquished by this time.

For areas where a lease sale has been held or announced by a proposed notice of sale, each study must be commenced not later than mid-March 1979. For areas where no sale has been held or scheduled before September 1978, a study must begin at least six months prior to holding a sale. The Amendments also require monitoring the environment after leasing and development of an OCS area to identify significant changes in the environment. After each fiscal year, the Secretary must submit to the Congress a publicly-available report assessing the cumulative effect of OCS activities on the environment.

The principal objective of the New Orleans studies program is to establish information needed by the decisionmaker for prediction, assessment, and management of impacts on the human, marine, and coastal environment of the OCS and nearshore areas which may be affected. The thrust of the studies program is progressing away from baseline or benchmark studies towards specific problem or informational needs; although some monitoring activities will be conducted to ensure that OCS activities do not seriously effect the environment. Several Bureau funded scientific investigations are being conducted in the Gulf of Mexico at the present time.

4. Call for Nominations and Tract Selection

A decision to substitute a proposed central and western Gulf of Mexico Sale 58A in lieu of indefinitely postponing proposed South Atlantic Sale 54 was announced by the Secretary of the Interior on April 25, 1978.

Proposed Sale 58A is a Departmental motion. No formal Call for Nominations and Comments was issued through the Federal Register. The blocks recommended in the Supplement to the Joint Recommendation are predominantly derived from blocks nominated in the Call for Proposed Sale 58, but not selected from the tentative tract list.

Each company that submitted nominations to the Call for Proposed Sale 58 was contacted individually. Each was invited to prepare a list of blocks as nominations for Proposed Sale 58A by first, second and third priority. They were further invited to present any data they wished to support their company's rationale for prioritizing their lists.

C. Relationships of Other Jurisdictions, Programs, Plans, and Proposals

1. Coastal Zone Management

The Coastal Zone Management Act of 1972 (16 U.S.C. 1451-1464), administered by the Department of Commerce, National Oceanic and Atmospheric Administration, provides grants-in-aid to states for the development and implementation of management plans to control land and water uses in the coastal zone.

Amendments to the Act, adopted in 1976, provide that states which are preparing a plan under Section 305 of the Act may receive supplementary grants and loans to reduce environmental and recreational losses within the coastal zone resulting from OCS and other energy developmental activities.

The Act requires that Federal actions within the coastal zone be consistent with the state's approved plan. At the same time, state plans must consider the national interest in energy facilities siting. Local governments, in turn, must consider state and regional interests in the exercise of their regulatory powers in the coastal zone.

The affected states adjacent to the proposed sale—Texas, Louisiana, Mississippi, and Alabama have received planning grants and are preparing plans for submission to the Secretary of Commerce. At the present time these programs do not include any additional restrictions on OCS activities.

2. Marine Fisheries Management

The Fishery Conservation and Management Act of 1976 (16 U.S.C. 1801-1882) established a 200-mile fisheries conservation zone off the United States and its possessions. The Act created eight Regional Fishery Management Councils composed of fishermen and other interested individuals, and State and Federal government agencies responsible for commercial and recreational fisheries. Under the Act, a detailed plan based on scientific and economic evidence must be prepared for each species (or related group of species) of fish harvested within each region. These plans are intended to provide detailed calculations of optimal sustained yield rates of harvest and methods of limiting the catch to such rates or promoting higher replacement rates. Each plan completed by a Regional Council must be approved by the Secretary of Commerce and implemented by the National Marine Fisheries Service. The Act is limited to the conservation of fishing resources. All of its purposes, policies and standards apply specifically to fishing and the division and control of fisheries. It is not applicable to OCS mineral development decisions.

No fisheries management plans have been completed by the Gulf of Mexico Regional Fishery Management Council; although, several draft plans are in preparation. Those plans tentatively scheduled for release in 1979 include: reef fish, October, 1979; groundfish and shrimp, November, 1979. In 1980, plans for sharks, coral, spiney lobster, and coastal pelagics will be released. The stone crab plan was approved by the Secretary of Commerce in March 1979.

3. Estuarine and Marine Sanctuaries

The Department of Commerce, National Oceanic and Atmospheric Administration (NOAA) is responsible for the National Estuarine Sanctuary and the National Marine Sanctuary Programs. These sanctuaries would provide special protection to designated unique habitats or resources in the marine environment.

The Coastal Zone Management Act authorized the creation of estuarine sanctuaries. Although this program is administered by NOAA, Office of Coastal Zone Management, any area designated as a National Estuarine Sanctuary would be owned and managed by the appropriate state which may cooperate with local government, and other public or private institutions or organizations. No national estuarine sanctuaries have been established in the planning region under consideration for this proposal.

Under the Marine Protection, Research and Sanctuaries Act of 1972 (16 U.S.C. 1431-1434), NOAA, Office of Coastal Zone Management is responsible for administering the Marine Sanctuaries Program. Areas designated in this system are managed at the federal level. Although no areas within the planning region of this proposal have been designated to date, several nominated areas are currently being evaluated.

The NOAA White Paper on the Proposed Designation of the Flower Garden Banks as a Marine Sanctuary (U.S. Department of Commerce, 1978) presents the rationale for designating this proposed marine sanctuary on the OCS offshore of Texas.

To protect the distinctive values of the Flower Garden Banks, the following activities would be regulated by the Secretary of Commerce within 4 nautical miles from the 100 m isobath, an area of approximately 225 square miles (sq mi):

(1) Removing, breaking or otherwise deliberately harming coral bottom formations or marine invertebrates or plants, or taking tropical fish, except incidentally to other fishing operations.

(2) Operations of vessels other than fishing vessels, including anchoring and navigation, and anchoring by fishing vessels.

(3) Dredging, or altering the sea bed in any manner.

(4) Construction.

(5) Discharging or depositing any substance or object.

(6) Using poisons, electric charges, spearguns or explosives.

(7) Trawling or dragging bottom gear within the 100 m isobath.

A draft and final environmental statement is now being prepared; public hearings will be held on the designation of the marine sanctuary and regulations promulgated to protect the sanctuary; formal consultation with the Secretaries of State, Defense, Interior, and Transportation, the Administrator of the Environmental Protection Agency, and other interested Federal agencies; and approval by the President must occur before designation by the Secretary of Commerce.

4. Other Federal Administrative and Regulatory Responsibilities

Several other Federal agencies are involved in the regulation of oil and gas operations on the OCS. The U.S. Army Corps of Engineers requires permits for structures or work in or affecting the navigable waters of the United States and for the construction of artificial islands and fixed structures on the OCS. In addition, the U.S. Coast Guard requires permits to insure that these activities are properly marked and lighted aids to navigation.

The Port and Tanker Safety Act of 1978 gives the Coast Guard, through the Department of Transportation, authority to designate shipping safety fairways in which structures cannot be erected or in which special restrictions or conditions can be imposed.

In May 1976, the Secretary of the Interior and the Secretary of Transportation signed a Memorandum of Understanding (MOU) regarding pipeline safety regulations on the OCS. This

MOU specifies each agency's responsibility for pipeline safety and their joint responsibility for inspection, enforcement, and coordination. Pipeline safety is regulated by the Materials Transportation Bureau (MTB).

The Department of Energy (DOE) and the Interstate Commerce Commission (ICC) regulate pipelines used in interstate commerce. The DOE sets the wellhead price of OCS-produced gas. Pursuant to the Department of Energy Organization Act, 91 Stat. 565 (1977), many of the functions formerly under the jurisdiction of the Federal Power Commission were transferred to the FERC within the Department of Energy. The FERC has responsibility to safeguard public convenience and necessity by certifying proposed interstate natural gas facilities. Additionally, on November 8, 1978, the National Energy Act (NEA) was signed into public law. The National Gas Policy Act (NGPA) is one part of the comprehensive NEA. The FERC will be primarily responsible for administering and enforcing the NGPA.

Under the provisions of OCS Order No. 7, operators on the OCS must comply with the requirements of the Federal Water Pollution Control Act Amendments of 1972, which establishes a National Pollution Discharge Elimination System (40 CFR 125) administered by EPA. Interim standards limit oil and grease discharges to an average 30 mg/l, but not to exceed a maximum of 52 mg/l on any one day. At the present time, EPA has not issued any NPDES permits for oil and gas operations in the Gulf even though all operators are required to apply for a permit prior to drilling. It is understood that EPA will not take any action against operators discharging into the Gulf without a permit so long as all Department of the Interior regulations are met. However, EPA has under consideration stringent permit conditions for discharges near the East and West Flower Garden Banks (NOAA's proposed marine sanctuary) (section IV.D.6.). In accordance with the same Act, the U.S. Coast Guard approves the procedures and equipment for the transfer of oil from vessel to vessel and between onshore and offshore facilities and vessels and conducts pollution surveillance patrols to detect oil discharges within territorial and contiguous waters. The Geological Survey performs surveillance for oil spills and discharges along pipeline routes.

In accordance with the provisions of the Federal Advisory Committee Act and the OCS Lands Act, an OCS Advisory Board has been established to advise the Department on discretionary functions under the OCS Lands Act. These functions include: resource evaluation, environmental assessment, leasing, mitigation of adverse impacts, and development plans.

The Board consists of one representative each from the Council on Environmental Quality, Departments of Commerce, Defense, Energy, Interior, State and Transportation, and the Environmental Protection Agency, as well as each of the 22 coastal states and Pennsylvania. Reorganization of the Board is under consideration at the present time.

The Marine Mammal Protection Act of 1972 (16 U.S.C. 1361 et seq.) established a national policy designed to protect and conserve marine mammals and their habitats. Authority for administering the Act has been delegated to the Department of Commerce, National Marine Fisheries Service, which is responsible for all cetaceans and pinnipeds except walrus; and the Department of the Interior, Fish and Wildlife Service, which is responsible for walrus, sea otters, polar bears, manatees, and dugongs.

The Marine Mammal Commission is responsible for reviewing and advising federal agencies on the protection and conservation of marine mammals. The Commission has a Committee of Scientific Advisors which provides advice on actions needed to fulfill the purposes of the Act.

The Endangered Species Act of 1973 (16 U.S.C. 1531-1543) established a national policy designed to protect and conserve threatened and endangered species and the ecosystem upon which they depend. This Act is administered by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. Section seven of the Act, governing interagency cooperation, requires Federal agencies to consult with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service to insure that their actions do not jeopardize the continued existence of a threatened or endangered species or result in the adverse modification or destruction of their critical habitat.

Military exercises and training operations are periodically conducted in the Gulf of Mexico by the U.S. Navy and Air Force. Gunnery, aircraft, missile, and submarine exercises may be conducted over areas proposed for leasing in this proposed sale.

The use of designated or interim ocean dumpsites will continue through the beginning of the next decade at which time EPA plans to phase out this practice. Given the anticipated level and timing of OCS related operations, ocean dumping would be occurring during the exploration and development phases of this proposed lease sale.

5. State Administrative and Regulatory Responsibilities

The governors of all of the coastal states are represented on the OCS Advisory Board and therefore have direct input into the OCS program.

Affected states within this proposed lease sale area have varying degrees of authority and responsibility over land use, transportation, public lands, environmental quality, public health, recreation, wildlife, and cultural resources.

Land use planning at the state level typically entails describing existing uses rather than attempting to guide or regulate future land uses. Land use, however, is significantly influenced by transportation planning decisions. Thus, state government indirectly may exert significant influence on land use decisions. State responsibilities include the construction and maintenance of state highways, roads and other modes of transportation. All affected states within the proposed sale area directly regulate intrastate pipelines, railroads, navigation canals and waterways, and aviation.

The four affected states hold certain lands in the public interest. These lands include: state parks, recreation areas, game management areas, wildlife refuges, historical and cultural sites, waterbottoms, and wetlands.

States directly regulate environmental quality through permitting processes and the enforcement of state and federal regulations governing waste disposal, air quality, water quality, and wildlife management.

6. Local Administration and Regulatory Responsibilities

County (or in Louisiana, parish), and municipal governments have been granted broad authority to control land uses within their jurisdiction. Texas and Alabama are expceptions which limit county powers while enabling cities broad powers to control land uses. Land use controls include: zoning, subdivision regulations, building codes, and performance standards for commercial and industrial facilities.

County and municipal governments are responsible for police and fire protection, local educational, recreational and cultural facilities, water supply, sewage, sanitation, and drainage systems, local roads and streets, and other functions authorized by law.

Section II

Description Of The Environment

A. Physical Environment

1. Geology

a. GENERAL GEOLOGY

The Gulf of Mexico presently represents a subsiding ocean basin partially filled with sediments. The abyssal Gulf is underlain by a simatic (oceanic type) crust. Domes and diapirs, anticlines and faulting in the western Gulf create the greatest geophysical interest from the petroleum standpoint. The occurrence of salt domes has led to the division of the northern Gulf continental shelf into two provinces. To the east of DeSoto Canyon (Submarine Physiography Visual) the shelf is composed largely of a thick sequence of carbonate deposits. Although salt domes occur in DeSoto Canyon, the general decrease in the number of domes east of the Mississippi Delta implies that the underlying salt deposits thin eastwardly. High areas in the basement rocks created a barrier to deposition and may have limited the extent of Jurassic salt deposition to the east along the northern Gulf (Antoine, 1972).

The continental shelf is a gently sloping (less than 1°) submarine plain of varying width forming part of the border of the continent out to a water depth of approximately 148 m, at which point the continental slope begins. The continental slope has a steeper gradient (approaching 5°) extending from the continental shelf to the oceanic depths.

The continental slope in the northwestern Gulf consists of two parts—a relatively steep lower slope which breaks off abruptly along the Sigsbee Scarp and the upper slope (1-2°) of hummocky topography made up of small domes (seaknolls) and depressions. This upper slope occurs at about the 150 m bathymetric contour which delineates the continental shelf-upper slope hinge line.

The structural grain and topography of the slope are controlled primarily by salt tectonics and the hummocky or hilly nature of the upper slope is due to diapiric salt structures. The top of the salt surface may be identified on seismic records as a weak reflector with a lack of bedding reflectors at depth. Seismic reflection profiles across the continental margin of Louisiana and Texas suggest that most of the topographic highs on the upper continental slope are probably associated with salt intrusions or shale diapirs.

b. GEOLOGIC HAZARDS

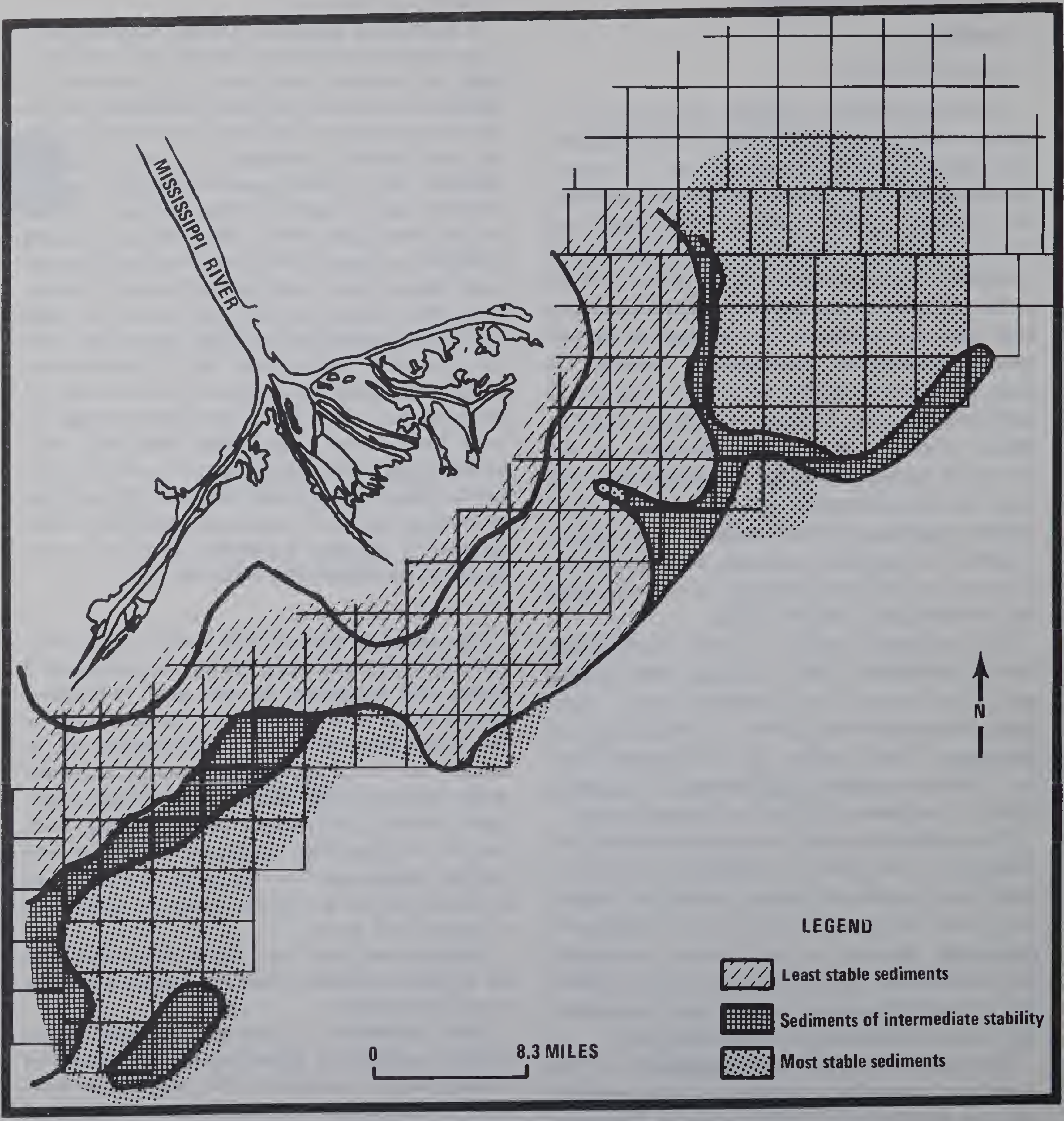
A number of important geologic hazards occur in the Gulf. In the Texas offshore area, the possibility of blowouts exist due to the presence of shallow gas deposits within the sediments. Deeper high pressure zones can also cause blowouts during the drilling operation. In the Louisiana offshore area, a third hazard is the highly unconsolidated gas saturated sediment being deposited by the Mississippi River. This material is being deposited so rapidly that gases from decaying organic matter cause voids and differential compaction. The material forms masses at the delta which can slump, flow, or slide. Some mud flows cover much of South Pass, (fig. 11) but rates of gravity movement downslope remain uncertain. A fourth hazard can occur in areas with a rough sea floor where coral heads, sharp reefs and structural troughs can damage rigs by jamming or having the legs slip off rough surfaces. The problem of locating rigs on a soft plastic sea floor is compounded in offshore Louisiana along the steeper slopes of the Mississippi Delta (fig. 12).

(1) Subsidence

The apparent rise in sea level or land subsidence is a hazard along the low coastal lands of Texas and Louisiana. In this area, subsidence cannot easily be separated from the effects of the rise in sea level because of encroachment of the ocean. The rise in sea level is generally attributed to the melting of glaciers and polar icecaps. However, regional geosynclinal down warping, compaction of pro-deltaic sediments and lateral and vertical displacement of clay under an overburden of sand and silt is a major cause of subsidence along the Gulf coast.

Gagliano and van Beek (1970) have calculated an average subsidence rate for coastal Louisiana to be .35 ft/century.

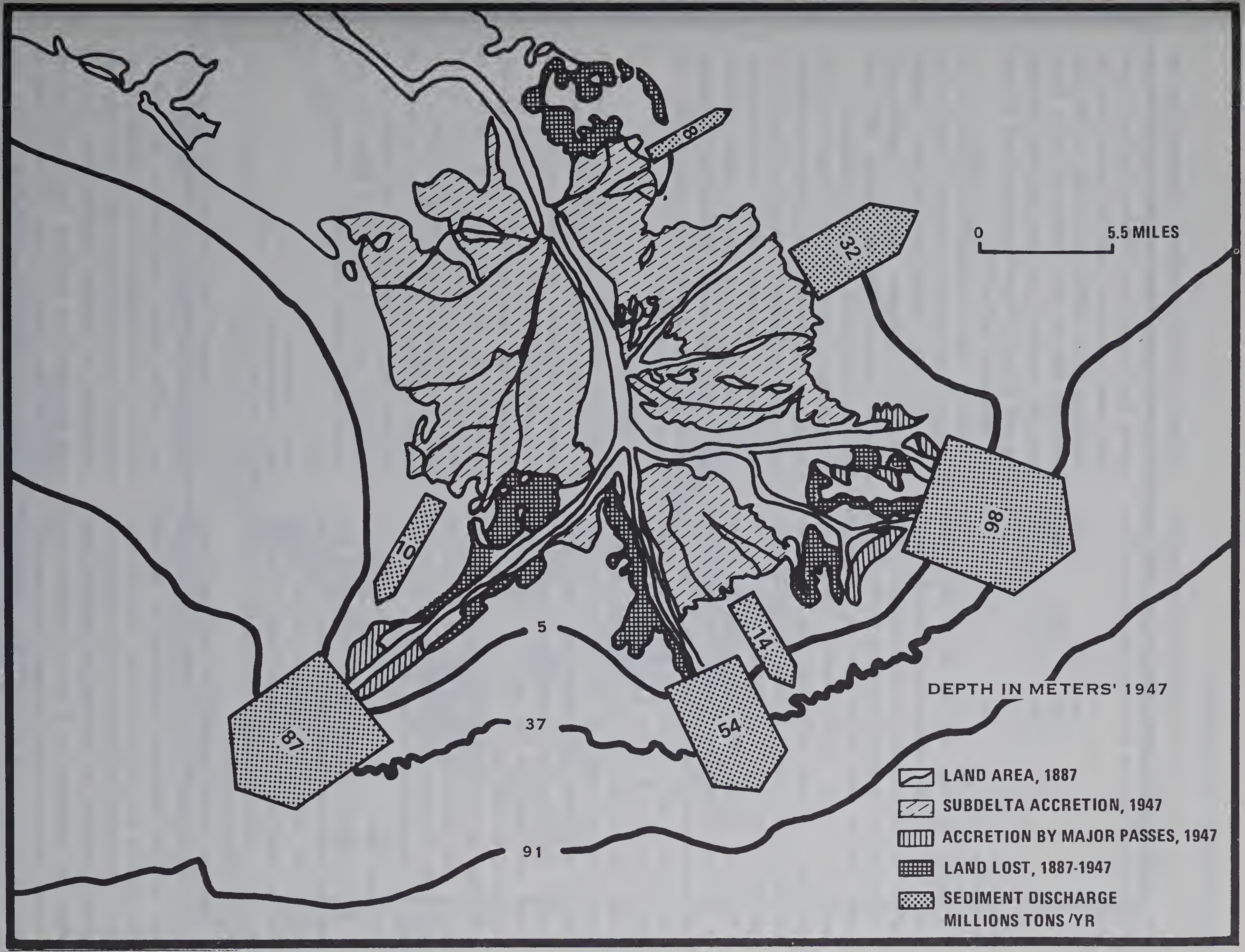
Land subsidence is generally attributed to extensive pumping of ground water and petroleum which causes a decline in the piezometric pressure in the porous rocks allowing once saturated beds to compress. Subsidence can also occur from sand and sulfur pumping and tunnel mining; however, this is rare in the areas under consideration. Subsidence may also be stimulated by overburden compaction as a result of dredging waterways. Levee flank depressions are created that develop into open water bodies. These water bodies are another factor in land loss within South Louisiana.



SOURCE: U.S. GEOLOCIAL SURVEY (1979)

FIGURE 11

RELATIVE INSTABILITY OF SURFACE SEDIMENTS



SOURCE: GALIANO ET AL. (1971)

FIGURE 12
MISSISSIPPI DELTA SEDIMENT DISCHARGE

National Ocean Survey (NOS) has maintained tide gauges and sea level data in the Gulf for many years. Data on two long term stations include:

Site	Year recording began	Years monitored	Sea level change (meters)
Pensacola, Fla	1923	47	0.13
Galveston, Tex	1908	62	0.39

Pumping of large amounts of ground water (from 1943–73) in the Houston-Galveston, Texas region, has resulted in water-level declines of as much as 61 m in wells completed in the Chicot aquifer and as much as 99 m in the Evangeline aquifer. From 1943–73, the maximum average annual rates of decline were 2.0 m in the Chicot aquifer and 3.3 m in the Evangeline aquifer. During 1964–73, the maximum rates were 3.0 m in the Chicot and 5.4 m in the Evangeline. The decline in artesian pressure has resulted in pronounced regional subsidence of the land surface.

Subsidence is centered at Pasadena, Texas where as much as 2.3 m of subsidence occurred from 1943–73 (fig. 13). In the southern part of Harris County, about 55 percent of the subsidence is a result of compaction in the Chicot aquifer. The area with subsidence of 0.3 m or more was about 906 km^2 in 1973 and has increased since then.

Planned use of surface water instead of ground water may result in some recovery of artesian pressures. If recovery occurs, the rate of subsidence should decrease substantially.

(2) *Mud Slides*

Recent studies of mud slide hazards in the Mississippi Delta were conducted by the U.S. Geological Survey with the cooperation of the Coastal Studies Institute of Louisiana State University. Figure 11 delineates areas where adverse foundation conditions can exist.

Berryhill (1975) outlined the following conditions for the South Texas OCS (fig. 14). Surficial and shallow subsurface sediments are typically fine grained and soft rather than firm and compact. This softer sediment province might have a greater tendency for retention of industrial pollutants, as compared to a more permeable and aerated sandy province. The outer one-quarter of the Rio Grande Delta is a potentially mobile area subject to future movement. Displacement of sediments by gravity sliding or slumping along the sea floor is restricted to the outer edge of the ancestral Rio Grande Delta. Within the South Texas study area, slumps of relatively large scale displacement occur at the outer edge of the shelf coincident with the upper continental slope. Landward and adjacent to the area of active slumping is a belt of older slumped sediments now covered by undeformed sediments.

Relatively rapid sediment movement can occur in lateral and vertical directions. These movements may cover larger areas and pose a hazard to sea floor structures similar to landslides to structures onshore, except offshore they may occur on slopes which are almost negligible.

Pioneering work by Shell Oil Company suggests that in some cases fluctuating pressures within the upper 32 m of sediment caused by storm waves may trigger a sediment failure. Other investigations conducted at the Coastal Studies Institute indicate that the content of dissolved and undissolved gases in sediments may play an important role in their instability.

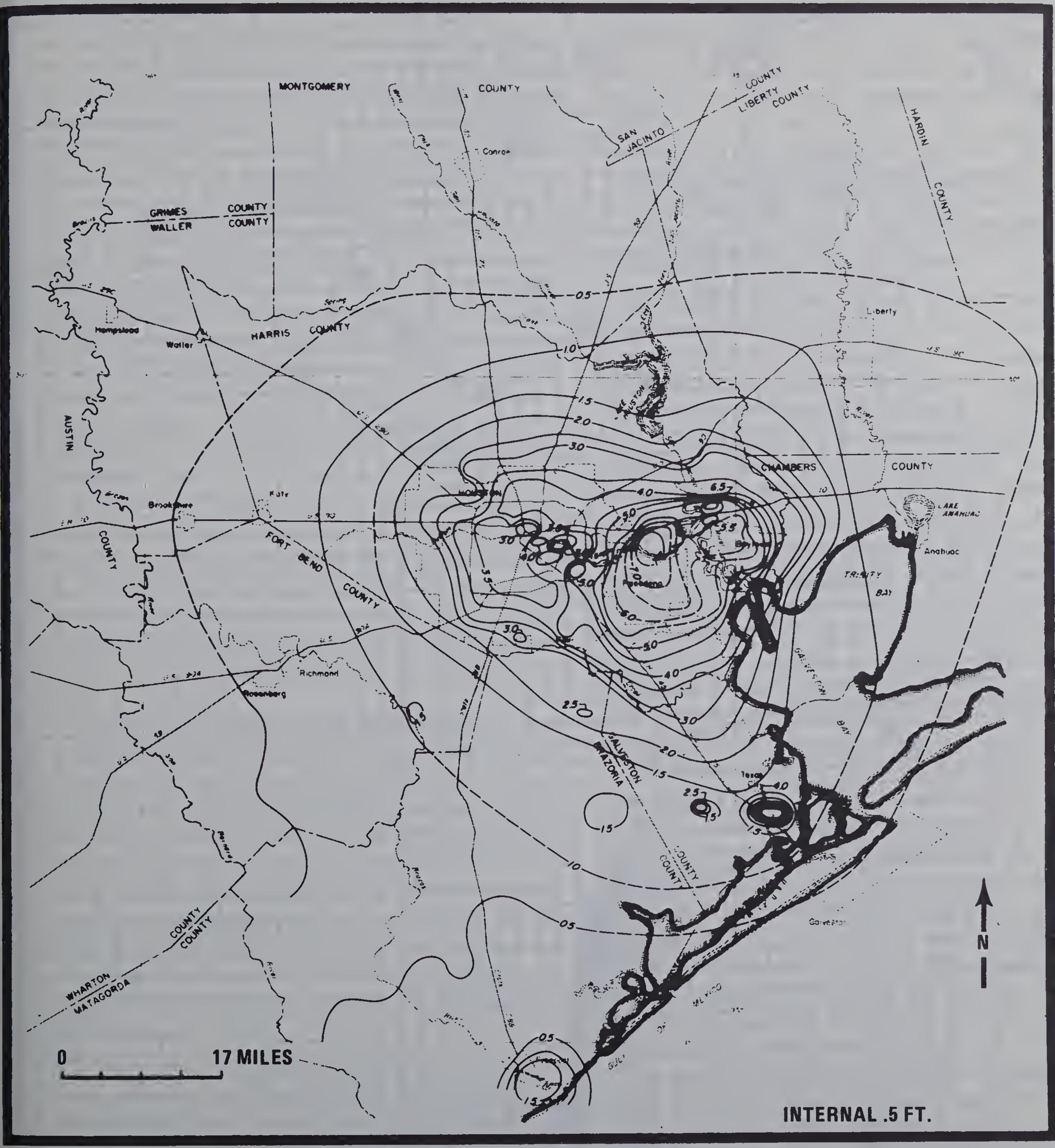
(3) *Earthquakes*

Of lesser importance in the Gulf of Mexico is the risk from earthquakes. No known damage to offshore structures has been recorded from earthquakes in the Gulf.

Seismic risk areas in the U.S. were originally designated in 1947 by the U.S. Coast and Geodetic Survey and have been revised several times since then. Seismic risk is expressed in arbitrary numbers from 0 to 3. They are based on historical data considering only the intensity of an earthquake, not the frequency of occurrence, and express the damage expected to occur in that area.

Zone 0—No damage
Zone 1—Minor damage
Zone 2—Moderate damage
Zone 3—Major damage

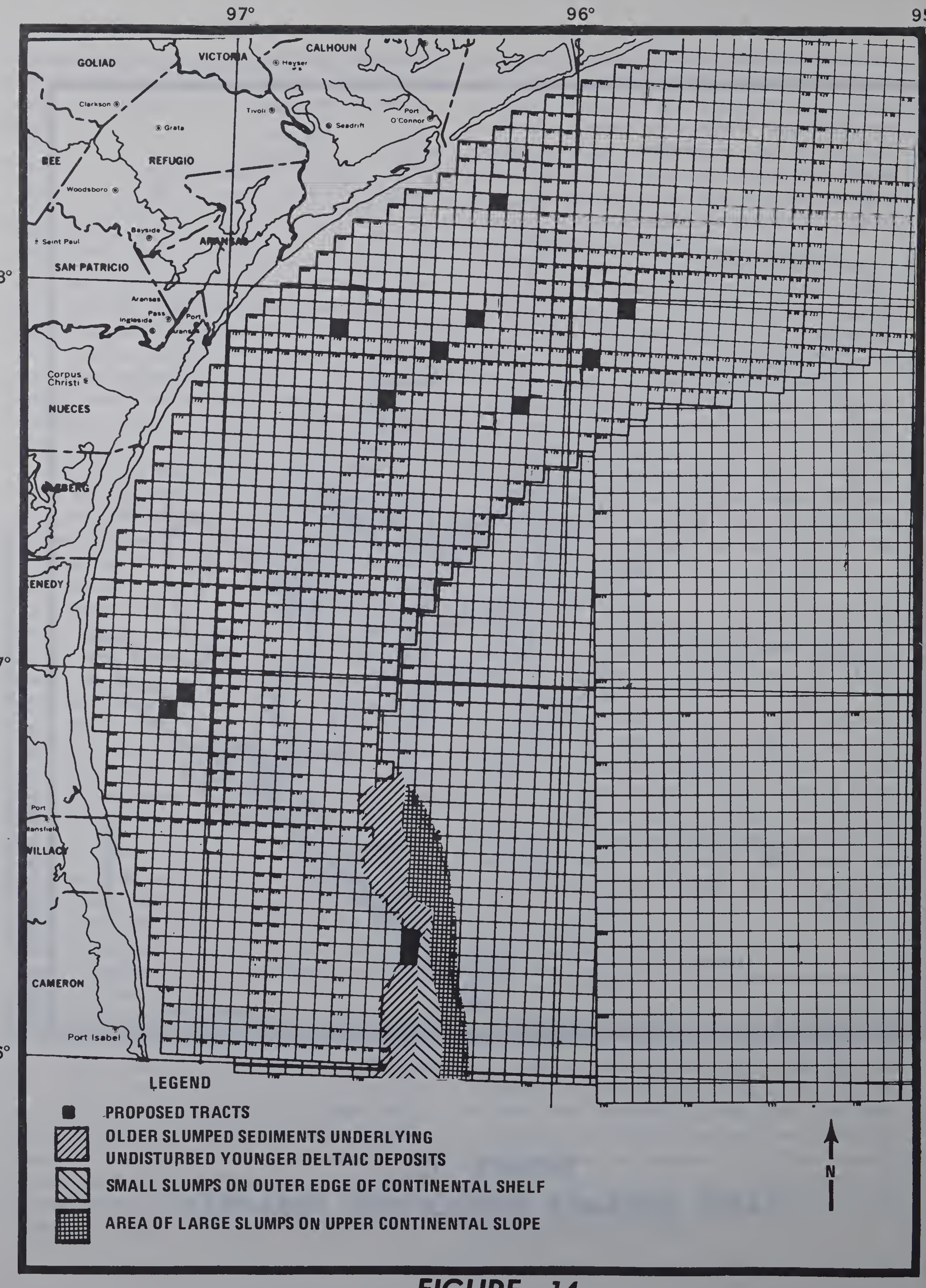
In the western Gulf, seismic risk is negligible (Algermissen and Perkins, 1976). This appears to be a rather unique area due to the lack of seismicity. No earthquakes of any notable intensity have been recorded for this area. Only two earthquakes of notable intensity have occurred near this area—one north of Vera Cruz, Mexico and one near 93°00′ W and 27°30′ N. Neither produced damaging tsunamis nor were they considered well located events.



SOURCE: GABRYSCH AND BONNET, 1975

NOTE: Line of equal land-surface subsidence, dashed where approximate.

FIGURE 13
LAND SURFACE SUBSIDENCE, 1943-1973



SOURCE: BERRYHILL (1975)

FIGURE 14

SLUMPED SEA FLOOR SEDIMENTS

(4) *Fault Displacement, Hydrocarbon Seeps and Seep Mounds*

Active faults, gas seeps and seep mounds pose dangers to offshore operations; however, these are some of the most obvious anomalies recorded by geophysical surveys. Active faults in hydrocarbon producing areas such as the vast salt dome province offshore Louisiana. (Visual No. 2) are generally associated with hydrocarbon (gas) seeps and unstable seep mound areas which can often grow to heights of more than 16 m. Areas underlain by salt domes, such as the Flower Garden Banks, Claypile and Stetson Banks. (Visual Nos. 2 and 4) are typical areas where active faults, gas seeps and seep mounds have been surveyed. Since these features are notable on side-scan and high-resolution seismic data, these survey techniques are routinely used to locate these hazards.

Berryhill (1975) has noted a number of plume-like traces, some parabolic and others more nearly straight lines, recorded on both the 3.5 Khz and mini-sparker acoustic profiles. Many of the plumes are directly above faults that either extend to the sea floor or lie at shallow depths beneath the sea floor suggesting natural gas seepage (fig. 15).

Active fault displacements, gas seeps and seep mounds are generally considered less hazardous than gas charged sediments and high pressure gas zones due to the recognizability of these features on survey records. Gas charged sediments, high pressure gas zones and gas saturated sediments in delta areas are significant potential hazards. Although geophysical techniques cannot detect high pressure zones directly, processed survey data frequently reveals velocity and amplitude anomalies which appear to correlate with geopressure zones.

(5) *Bathymetric Prominences and Steep Slopes*

Rough sea floor conditions with coral growth, reef scarps and troughs can be hazardous to offshore structures. Shipwrecks and large artificial reefs hazards pose if disturbed by high currents and bottom instability during severe storms. These problem areas can be located by modern geophysical equipment.

(6) *Geomagnetic Anomalies*

Geomagnetic anomalies indicative of potential cultural resources on ocean floor debris may represent a potential construction hazard.

(7) *Rating of Hazards*

It is not entirely realistic to rate hazards since they vary greatly in areal extent, magnitude, intensity, and occurrence. Each hazard must be studied on a case-by-case basis in each particular area.

During its review of applications to drill, the USGS informs the applicant of geologic hazards in the proposed area of operations and requires the applicant to submit an operational plan which outlines procedures to deal with these hazards.

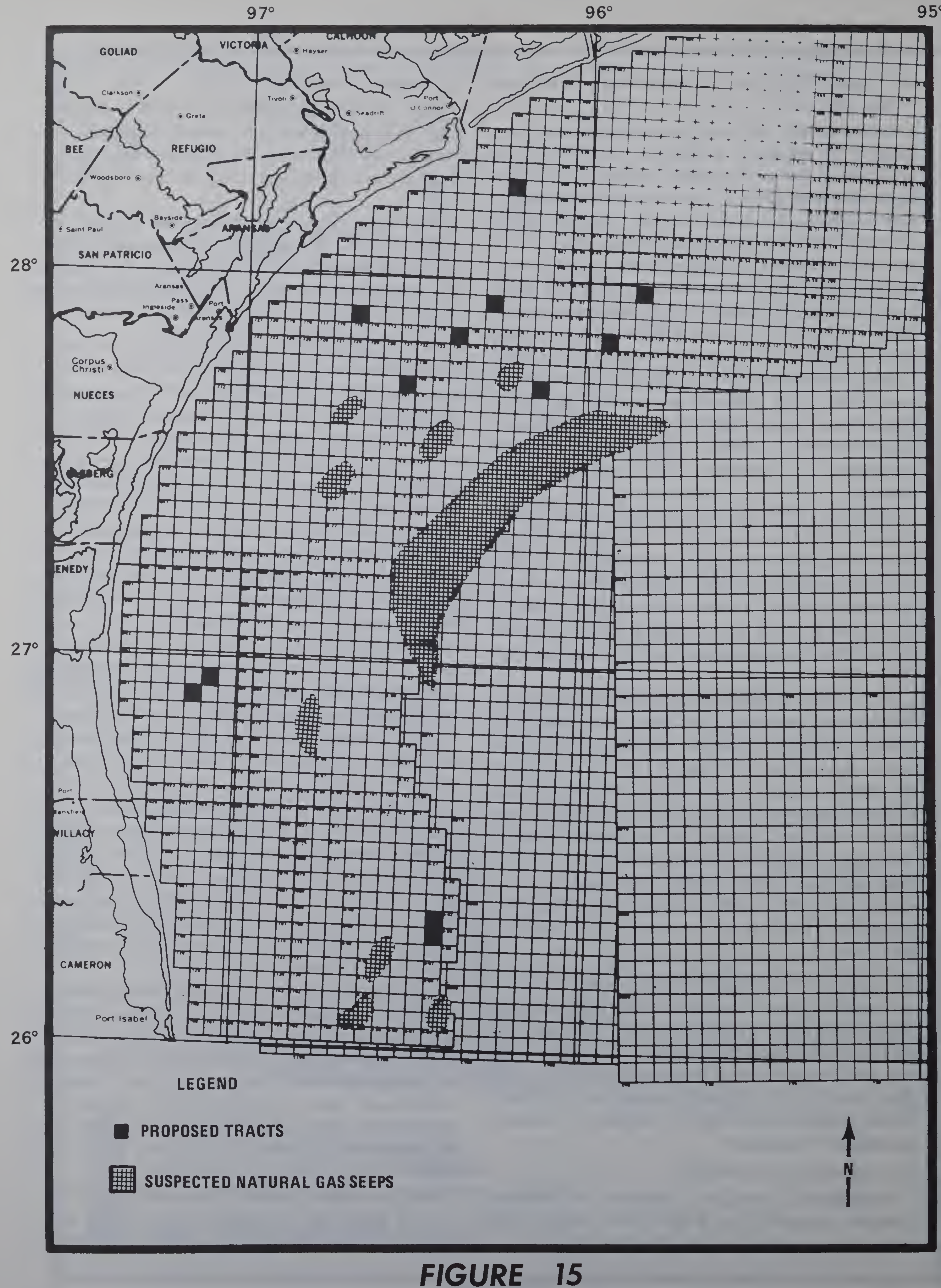
c. BOTTOM SEDIMENTS

Sedimentation in the Gulf of Mexico has been complicated by transgression and regression of the shoreline in response to changes in sea level and tectonic movement. The pattern of deposition is one of transgression interrupted by minor regressions. The result is a sequence of continental, deltaic or paralic, and shallow water sandstones, siltstones, and shales being progressively built out over marine deposits. In the past, particularly in the Pleistocene, the sea level has changed in response to glaciation. This upset the normal progradation of the shoreline and created extensive salt marshes in areas now submerged. Decay of buried organic matter from brackish marshes are thought to be the primary source of the hydrocarbons found on the continental shelf.

The Mississippi Fan dominates the north central Gulf region (Visual No. 2). This thick accumulation of primarily Quaternary alluvium extends over a 414,000 km² area including parts of the shelf, slope, rise and abyssal floor. Bottom gradients range from two degrees near the apex to about 0.3° at the outer margin more than 644 km to the southeast. Within this slope, the greatest change in gradient occurs at the 2,500 m isobath divides the fan into upper and lower segments (Huang and Goodell, 1970).

Historically, the site of active deltaic build-up along the Louisiana coast has shifted several times during the past million years. Kolb and van Lopik (1966) identified at least seven subdeltas of the Mississippi Delta complex. The river's modern "birds-foot" delta, the Balize Lobe, extends underwater almost to the continental slope and represents the uppermost part of the Mississippi Fan.

The Mississippi Fan and major portions of the abyssal plain and continental rise contain sediments that were transported in part by turbidity



SOURCE: BERRYHILL (1975)

FIGURE 15
SUSPECTED NATURAL GAS SEEPS

currents and in part deposited pelagically. Sediments in these areas have been derived from the northern and western shelves and slopes; however, the bulk has been derived from the Mississippi Delta. The midwestern and southwestern Gulf have sediments that are more pelagic in origin. Their carbonate content is high and is made up in major part by foraminifera tests. A low accumulation rate is assumed for this area based on the observed high degree of bioturbation.

The Alaminos, Mississippi and DeSoto Canyons are inactive canyons in which the upper part of the sediment column does not reveal typical submarine canyon characteristics but rather a homogeneous ooze sediment type as fillings.

Relief features associated with the shelf edge and slope have been reported by Uchupi (1967), and Bergantino (1971) (Submarine Physiography Visual).

Sediment maps for the Gulf of Mexico (Visual No. 3) have been compiled principally from a map by Grady (1970) and Berryhill (1975).

Localized sediment maps for the areas south of Timbalier Bay to Grand Isle (Gulf Universities' Research Consortium, 1974) and Mississippi Sound (Eleuterius, 1974) contain detailed information useful as a supplement to the regional sediment map by Grady (1970).

According to Curray (1960) and Shepard (1960), the surface sediments of the shelf are mainly Holocene in age and are products of the marine transgression (depositions during sea level fluctuations) following the Wisconsin glaciation.

Texturally, the South Texas sea floor is composed predominantly of mud. Quantitatively the highly dominant mud component is the silt fraction which appears to be effectively trapped hydraulically within the continental shelf environment. In contrast, the subordinate clay fraction appears to reflect a more open dispersal system with substantial clay detritus escaping into deeper environments. The majority of this region can be classified as a clayey silt province. Sand detritus is quantitatively dominant within portions of the ancestral Brazos-Colorado and Rio Grande deltas. The gravel fraction is composed almost entirely of biogenic materials; it consists mainly of molluscan shells and occasional coral-algal reef debris in the vicinity of carbonate banks.

SHALLOW SUBSURFACE SEDIMENTS

The stratigraphic variability of the shallow upper Holocene deposits exposed in gravity cores indicates that the basic regional dispersal pattern exhibited by present sea floor sediments was initiated during earlier Holocene time. However, the relative proportions of sand and mud were different, with the sand facies being more widely distributed during the earlier Holocene. The cores illustrate a general westward displacement of the lithofacies pattern indicating a stratigraphic overlap which developed during the late Holocene transgression. The cores further suggest that the shallower, inner portion of the Texas shelf is most intensely affected by storm hydraulics regime. Many discrete sand sediment units appear to reflect storm-generated deposits resulting from the seaward flux of coastal waters following storm surges. These units are most abundant in local areas adjacent to prominent coastal estuaries which appear to have been major sources of sediment.

The origin of East and West Flower Garden Banks is the joint growth of upward moving salt plugs and reef building corals. The bank which has been studied to the greatest extent is the West Flower Garden. Edwards (1971) gives a complete history of studies there. A recent study by several investigators discussed the geology, geo-chemistry, sediment distribution and biology of a portion of the bank under the auspices of the Flower Garden Ocean Research Center during 1972. This study concentrated on the high part of the bank in the area of active reef building coral. A wealth of excellent photographs and valuable data was collected by Bright and Pequegnat (1974).

Other major banks have not received as extensive research; however, Stetson Bank appears most like the Flower Garden Banks (Bright and Pequegnat, 1974). Over sixty such banks are clustered along the 183 m depth contour offshore of western Louisiana and eastern Texas. This alignment also coincides with the Pleistocene gas deposit trend along the edge of the shelf. A major petroleum interest is devoted to these areas.

The alignment of these banks constitutes a record of ancient shorelines (Curray, 1960). Many of these banks were the result of a nearshore environment; hence, the oyster, clam and other shell deposits. In other cases, lagoonal mud deposits and nearshore beach strands have been preserved. In most cases, these banks were presumed to have developed during the Pleistocene and Holocene; however, research of many of these features has been either cursory or nonexistent. Many banks probably existed during various stands of sea level in late Pleistocene where shell growth or calcerous cementation of sediments occurred. This condition could have occurred out to the present 100 m water depth (fig. 16). As the beach lines migrated due to changes in sea level, the unconsolidated barrier deposits or topographic high along the beaches were destroyed and reworked; leaving the shell beds, cemented sands and clays as bathymetric highs due to their resistance to erosion.

SUSPENDED SEDIMENTS

Variable sediment concentration-depth relationships prevailed over the South Texas OCS during the survey period (fig. 17). Concentration gradient reversals occur at the majority of stations; the reversals are most frequently, but not exclusively, associated with thermoclines. The reversals can result in either concentration maxima or minima at the thermocline level. Continuously increasing concentration gradients are also frequently associated with thermoclines but can also occur in unstratified water columns. The majority of stations show a net increase in sediment concentration with depth; however, a net decrease is not uncommon, especially among the shallower stations. In essence, no systematic sediment concentration-depth relationship is readily apparent. This is attributed both to a complex thermo-density structure of the OCS hydraulic regime during the survey period as well as to the non-synoptic nature of the water samples. The water sampling phase extended over a two-month period characterized by highly variable atmospheric and sea state conditions, a factor that would tend to obscure any systematic sediment concentration-depth relationships.

d. PETROLEUM GEOLOGY

The most prominent structural anomalies in the northwestern Gulf are salt domes (Visual No. 2) and a series of regional, down-to-the-Gulf faults which have materially effected sedimentation across them. Less common are deep-seated, low-relief up-lifts and shale domes. These structural features are related to the presence of an underlying salt basin and the Cenozoic sedimentary wedge which has gradually advanced seaward across it.

The abundant salt dome structures around which most of the oil pools off East Texas and Louisiana have formed are rare off South Texas. Although salt is thought to be present at depth, it has not formed diapirs so freely for reasons not well understood. Large salt structures are present in deeper water near the base of the slope, but they are not structurally similar to the piercement domes to the northeast, and their trapping capabilities are not known. Several large, linear deep-seated anticlinal structures are present near the mid-shelf area but little can be said of their origin on the basis of available seismic records. In the coastal area from Corpus Christi to Matagorda Bay, a number of domes with cores of shale are present. Their extent is not fully known, but hydrocarbon production has been obtained from at least a few.

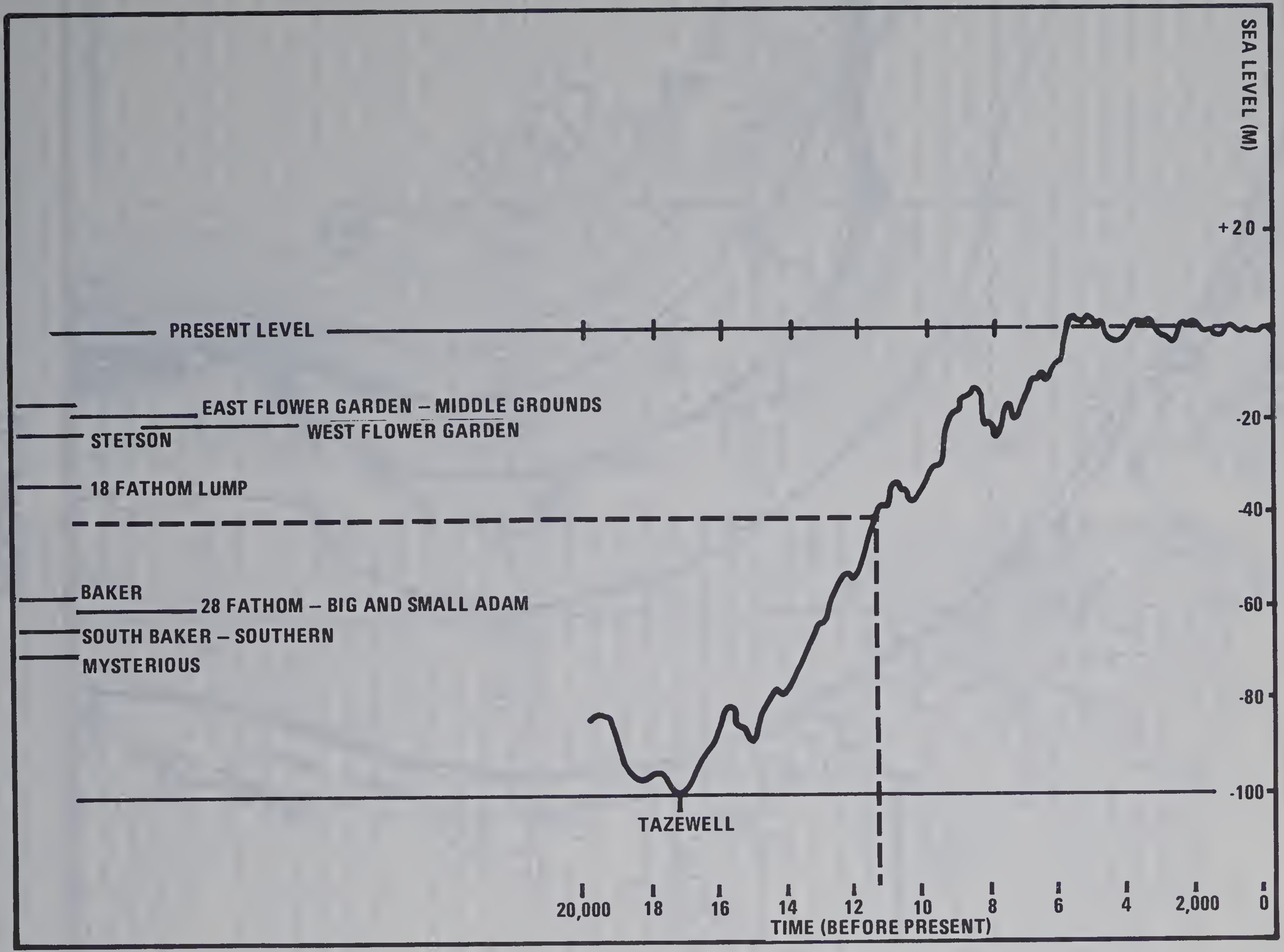
A series of regional faults commonly called ''growth faults'' are present in the Texas-Louisiana subsurface. They are aligned approximately parallel to the coast. These are normal faults, long and arcuate in the horizontal plane, with large amounts of vertical displacement downward into the coastal basin. Rock units commonly show greater thicknesses on the downthrown sides of these faults, thus fault movement and deposition must have been essentially contemporaneous. The downthrown section acted as a topographic depression for localized deposition.

A veneer of Miocene and Pliocene overlain by a thicker section of Pleistocene derived from the Mississippi River system was supplied to the offshore Louisiana area. The Texas shelf, at the same time, received smaller volumes of sediment because it was on the western border of the Mississippi River depocenter.

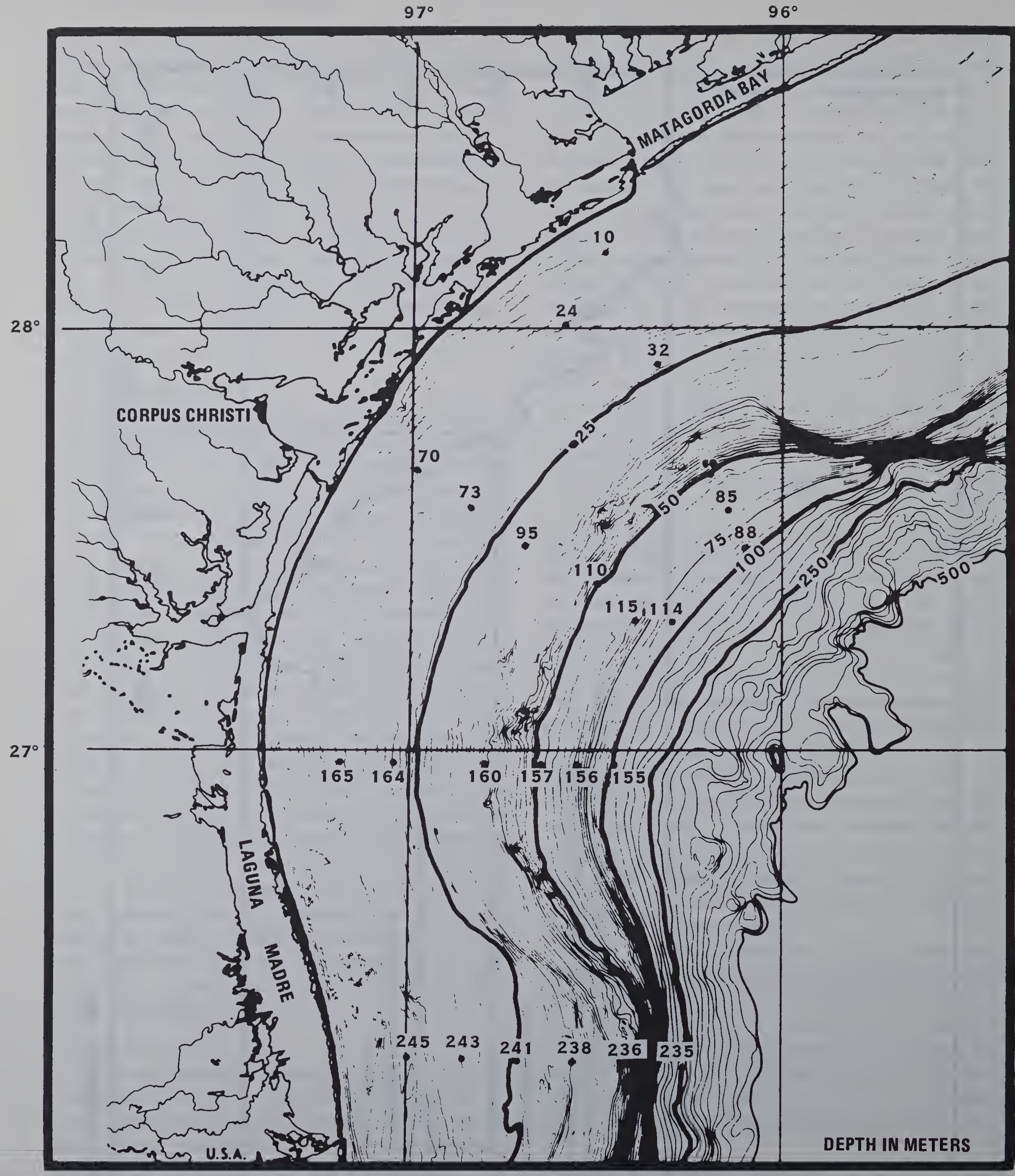
Since natural production of oil and gas frequently occurs along the continental shelf-slope break, the progradation of the north-central Gulf depositional regime has resulted in the migration of this production zone seaward, developing a series of progressively younger bands of trends. Late Tertiary and Quaternary production trends which underlie this area are shown on Visual No. 2.

Future Pleistocene production from upper continental slope region (200–1,000 m water depth) adjacent to the Texas-Louisiana OCS, though certainly not improbable, remain speculative despite recent discoveries in the deeper water off the Mississippi Delta that suggest the potential of this

FIGURE 16
SEA LEVEL FLUCTUATIONS



SOURCE: FAIRBRIDGE, 1960



SOURCE: BARRYHILL, 1975

FIGURE 17

LOCATION OF SAMPLE STATIONS FOR SUSPENDED SEDIMENTS new province. The continental slope represents the seaward face of the Gulf Coast basin and includes all of the relatively steeply sloping seabed from the shelf edge to the abyssal floor. The prospective horizon of the upper slope should consist of a thin section of Miocene and Pliocene overlain by thick intervals of Pleistocene. The Pleistocene sediments are considered the most prospective reservoir beds. The structural grain and hummocky topography of the slope are controlled primarily by salt tectonics and virtually the entire province is underlain by gigantic salt stocks and swells (Lehner, 1967).

Basinal areas between salt structures in the upper slope contain as much as 3500 m of sediments, most of which appear to be muddy slump desposits with infrequent turbidite sand zones. It has been speculated that turbidite sands of reservoir quality could conceivably be present on the upper slope, especially in deposits of Pleistocene Age, which were derived from inner shelf areas deposited during glacial epochs when the sea level was lower and shoreline was close to the present shelf edge.

There are approximately 272 fields on the Federal OCS of the Gulf of Mexico. Of these 190 primarily produce gas and 75 primarily produce oil. In the remaining 7 production or productivity has not been determined yet. In September of 1975, USGS reclassified the fields in the Gulf of Mexico, as a result the number of fields has changed. Production depths range from about 300 m to 5550 m, with most production occurring between 2600 and 3900 m. USGS records show that 3.795 billion barrels of oil and condensate and 0.684 trillion m^3 of gas have been produced from Federal OCS lands as of May, 1976.

The most prolific offshore production comes from the Miocene of the eastern Louisiana OCS. This area, as currently defined, has more oil than the remainder of the Texas-Louisiana area. The next most productive trend is the Pliocene trend of central Louisiana OCS which produces about 50 percent oil and 50 percent gas. Further to the west this producing trend dies out. The Miocene of western Louisiana is the third most productive trend producing mostly gas, and the Pleistocene of offshore western Louisiana ranks fourth.

The clastic sediments derived from the ancestral Mississippi River system have built out as deltaic deposits in the Gulf. The prospective sediments underlying the Texas-Louisiana shelf are those of Oligocene, Miocene, Pliocene and Pleistocene Age.

2. Climate

A. GENERAL DESCRIPTION

The climate of the northern Gulf of Mexico and adjacent coastal region is determined by four major factors; the North American Continental land mass, the Azores-Bermuda high pressure cell, subtropical latitude, and the relatively warm waters of the Gulf of Mexico itself. The principal influence is the Gulf, resulting in a maritime tropical climate for the region.

During the winter, polar continental air masses move southward into the Gulf of Mexico causing occasional sudden drops in temperature. As these cold fronts reach the Gulf of Mexico, the maritime tropical air flowing northward causes the fronts to abate and become stationary. These stationary fronts are favorable for the formation of low centers that often move west to east along the Gulf Coast or move inland producing low clouds and rain. The cold continental air masses have a tendency to lower the sea surface temperature offshore. The cold water temperatures cause the formation of advective fog in coastal areas from November to March.

By spring, the Bermuda high develops its influence over the region thus improving the weather considerably. The ridge of high pressure usually blocks the movement of storm systems from the west. Occasionally, tropical disturbances and easterly waves will appear in the Gulf of Mexico by early summer (U.S. Dept. of Commerce, NOAA, 1972).

During the summer, southerly winds of the Bermuda high bring warm moist tropical air onshore. Daily shower activity occurs in near shore waters and along the coast with most activity in the afternoon. Westerly and northerly winds generally bring periods of hotter and drier weather into the region.

Easterly waves and tropical storms appear in the Gulf during late summer and early fall. The principal paths of tropical storms into the Gulf are through the Yucatan Channel and Straits of Florida. Over half of these tropical storms become hurricanes during this season. During October and November, the Bermuda high loses its strength and allows continental air to again exert influence on the Gulf of Mexico and coastal region.

b. PRESSURE, TEMPERATURE, AND RELATIVE HUMIDITY

(1) *Pressure*

The western extension of the Bermuda high pressure cell dominates circulation throughout the year, weakening in winter and strengthening in summer. The average monthly pressure reaches a minimum in summer ranging from 1,014 to 1,016 millibars from west to east over the northern Gulf of Mexico. The average monthly pressure reaches a maximum of 1,021 millibars during the winter in this region. The maximum average monthly pressures result from the influence of continental cold air present during winter. The minimum pressures occur during the summer when the equatorial trough shifts northward influencing the region.

(2) *Temperature*

Average temperatures at coastal locations vary with latitude and exposure. In winter they depend on the frequency and intensity of penetration by polar air masses from the north. These incursions, when they bring strong northerly winds, are called "northers" and may occur some 15 to 30 times between November through March.

Air temperatures over the open Gulf exhibit narrower limits of variations both on a daily and seasonal basis (fig. 18). In the summer, average temperature over the center of the Gulf is about 29° C. Winter air temperatures in the Gulf of Mexico near the coastal areas affected by this proposed sale average between 17-20° C.

(3) *Relative Humidity*

Over the entire region, the relative humidities are high throughout the year. Maximum humidities occur during the spring and summer months when prevailing southerly winds bring warm moist air into the area. Minimum humidities occur when cold continental air masses bring dry air into the northern Gulf of Mexico during the late fall and winter. For recording stations from Brownsville, Texas, to Apalachicola, Florida, the relative humidity annually varies from a high of 87 percent at 6 a.m. to a low of 63 percent at 12 noon. This variation in a six hour period is caused by daily warming.

c. SURFACE WINDS

The Azores-Bermuda atmospheric high pressure cell dominates the circulation over the Gulf, particularly during the spring and summer months. In late summer there is a general northward shift of the circulation and the Gulf comes under the more direct influence of the equatorial low pressure belt. During the relatively constant summer conditions, the southerly position of the Azores-Bermuda cell brings about predominance of south-easterly winds. The winds tend to become more southerly in the northern part of the Gulf. During the winter, winds usually blow from easterly directions with fewer southerlies but more northerlies. Winds from west and southwest are rare anytime during the year.

Near the coast, winds are more variable than over the open waters because the coastal winds fall more directly under the influence of the moving cyclonic storms that are characteristic of the continent and because of the sea and land breeze regime.

d. PRECIPITATION, CLOUDINESS, AND VISIBILITY

(1) *Precipitation*

Average annual precipitation along the Gulf coast ranges from approximately 69 cm at Brownsville, Texas, 102 cm at Galveston, Texas, and 137 cm at New Orleans, Louisiana. Rainfall is fairly evenly distributed throughout the year, with the greatest amounts occurring during the months when the winds are predominantly out of the southeast and south, namely June, July and August. This is not to imply a continuity of precipitation for the South Texas region.

Along the eastern part of the proposed sale area precipitation is frequent and abundant throughout the year but does show distinct seasonal variation. At New Orleans, October is the only month with a precipitation average less than 8 cm. July, the wettest month, receives just under 18 cm. Stations along the entire coast record the highest precipitation values during the warmer months of the year. The month of maximum rainfall for most locations is July, however, at Brownsville the record maximum is in September. Winter rains are associated with the frequent passage of frontal systems through the area. Rainfalls are generally slow, steady and relatively continuous, often lasting several days. Snowfalls are rare, and when frozen precipitation does occur it usually melts upon contact with the ground. Incidence of frozen precipitation decreases with distance offshore and rapidly reaches zero.

The warmer months usually have convective cloud systems which produce showers and thunderstorms; however, thunderstorms of this type

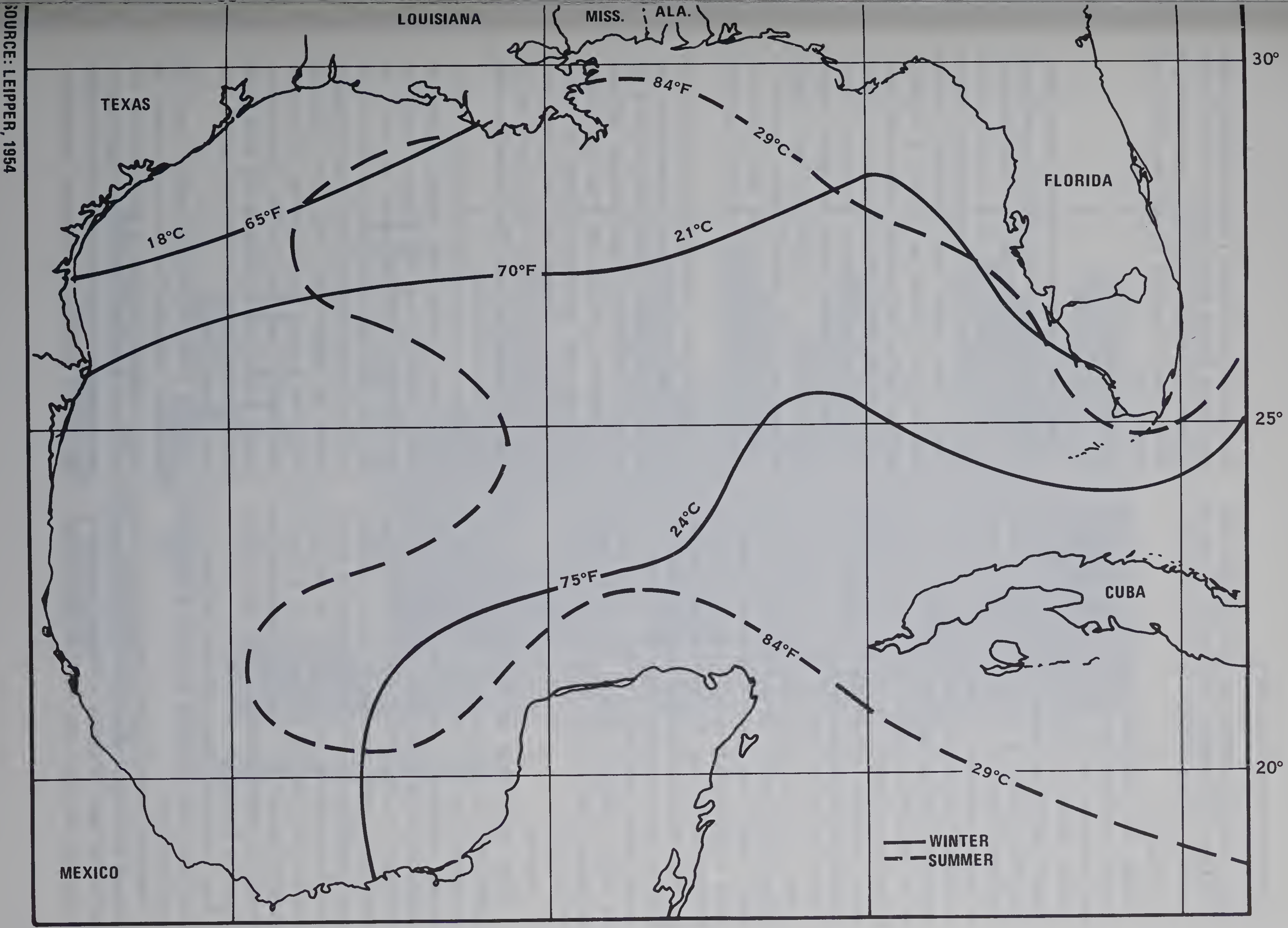


FIGURE 18

AVERAGE SURFACE AIR TEMPERATURES

rarely cause any damage or have attendant hail (U.S. Dept. of Commerce, 1967 and U.S. Dept. of Commerce, NOAA, 1972).

(2) *Cloudiness*

Along the Texas and Louisiana Gulf coast cloudiness averages between ⅜ to ⅝ sky cover with relatively small seasonal variation. The cloudier season is winter and early spring with summer and fall being generally clearer. The Climatic Atlas of the U.S. (U.S. Dept. of Commerce, 1968) shows that the central Gulf Coast received the highest percentage of possible sunshine in the summer and fall, ranging between 60 percent and 70 percent, with the high in October. The percentage of possible sunshine declines to a low in December and January (50 percent or less) and increases gradually through the spring and early summer into the 60 percent range.

During the warm season, May through September, cumulus clouds begin developing over northern Gulf waters about 0300 hours and the larger clouds may produce scattered showers which dissipate when carried onshore during the morning by the sea breeze. Onshore cumulus development occurs during the day reaching maximum in late afternoon, often accompanied by rainfall (Orton, 1976). Much of the summer clouds are either convective cumuli or high, relatively transparent clouds (U.S. Dept. of Commerce, NOAA, 1972).

(3) *Visibility*

Warm, moist Gulf air blowing slowly over chilled land or water surfaces brings about the formation of the fog. The period from November through April has the highest frequencies of low visibilities. On the south Texas coast, fog reduces visibility to less than ⅝ of a mile on an average of 28 days a year. Very dense fog in Galveston makes visibilities of ⅜ of a mile about 16 days a year. Port Arthur has an average of 42 days each year in which visibility is less than ⅜ of a mile. Visibility around the Mississippi Delta may be lowered by industrial pollution from New Orleans or burning marshlands.

Fog occurrence does decrease seaward but there have been visibilities less than ½ mile due to fog offshore.

Generally, coastal fogs last three or four hours although particularly dense sea fogs may persist for several days. Visibility offshore Louisiana is reduced to less than 5 km on a monthly average of 4 percent of the time. Poorest visibility conditions occur during winter and early spring when visibility is reduced to less than 5 km between 8 percent and 10 percent of the time (Peak and Muller, 1971).

E. SEVERE STORMS

(1) *Tropical Cyclones*

The largest and most destructive storms affecting the Gulf of Mexico and adjacent coastal zones are tropical cyclones. These have their origin over the warm tropical waters of the central Atlantic Ocean, Caribbean Sea or southeastern Gulf of Mexico. They occur most frequently between June and late October and there is a relatively high probability that tropical cyclones will cause damage in the Gulf of Mexico each year. Figure 19 presents the probability of occurrence of three categories of severe storms in certain coastal areas. Statistics for hurricanes and tropical cyclones are often lumped together since it is often difficult, especially in the older records, to determine the storm intensity while at sea (table 7).

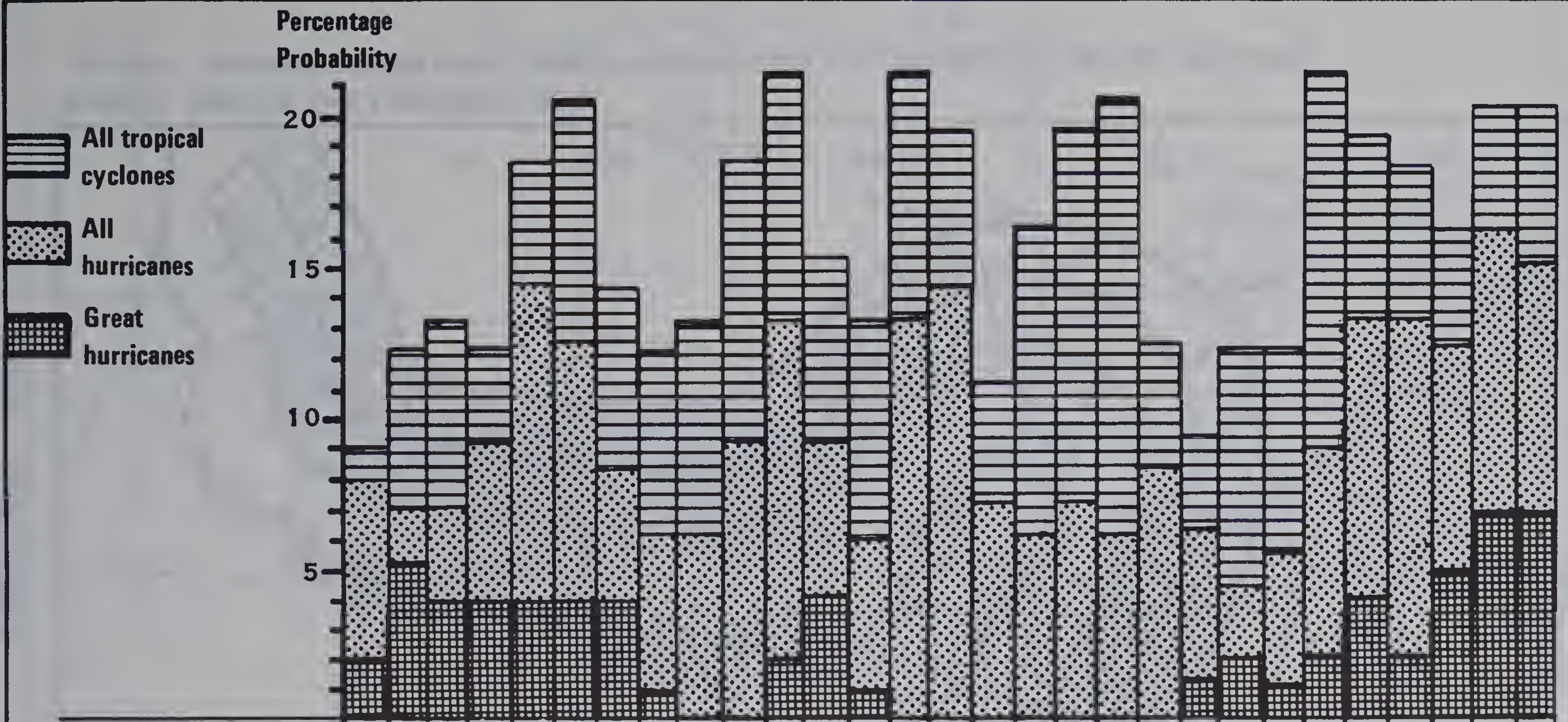
Hurricanes vary considerably in intensity track patterns and behavior upon crossing land. McGowen, et al. (1970), explains that the storm approach is marked by rising tides and increased wind velocities; generally the longer a storm lingers in the Gulf, the larger the bulge of water it pushes ashore as it approaches land. These storm tides are commonly higher in the bays than on Gulf sea beaches, although flooding and pounding waves effect both areas.

There is no preferred approaching route of hurricane tracks although early season cyclones approach generally from the southeast while later ones are more out of the south. In spite of the fact that most hurricanes form in tropical ocean areas, a few are generated in the Gulf of Mexico. During the period 1901–1971, seven hurricanes and seven tropical storms formed in the Gulf north of 25° N and east of 85° W (Selected Hurricanes Visual). These storm tracks were traced from 12 hour plots; therefore, the landfall locations are approximate.

Damage from hurricanes results from high winds and, particularly in the coastal areas, the storm surge or tide which is an abnormally high rise in the water level. Maximum surge height at any location is dependent on many factors including bottom topography, coastline configuration

FIGURE 19

PROBABILITY OF OCCURRANCE OF A TROPICAL CYCLONE

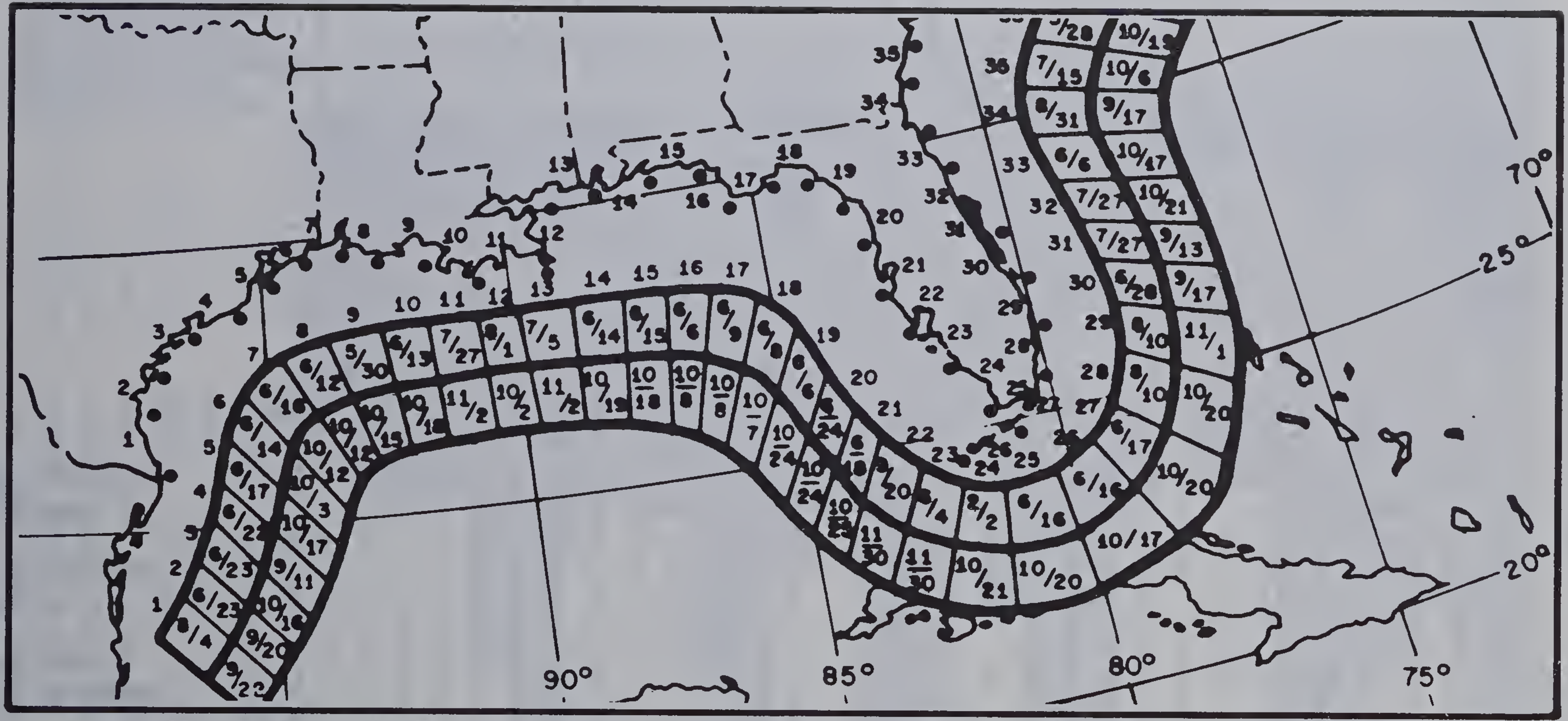


COASTAL SECTOR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
ALL TROP. CYCLONES	9	12	13	12	18	20	14	12	13	18	21	15	13	21	19	11	16	19	20	12	9	12	12	21	19	18	16	20	20
ALL HURRICANES	8	7	7	9	14	12	8	6	6	9	13	9	6	13	14	7	6	7	8	8	6	4	5	9	13	13	12	16	15
GREAT HURRICANES	2	5	4	4	4	4	4	1	-	-	2	4	1	-	-	-	-	-	-	-	1	2	1	2	4	2	5	7	7

SOURCE: SIMPSON AND LAWRENCE, 1971

FIGURE 20

OCCURRENCE OF TROPICAL CYCLONES, 1886-1970



SOURCE: SIMPSON AND LAWRENCE (1971)

NOTES: NUMBERS WITHIN BOXES INDICATE MONTH AND DAY OF EARLIEST AND LATEST EVENT.

Table 7
Frequency of Hurricanes in the Gulf of Mexico, 1899-1971

Area	Tropical Cyclone (Number)	Reoccurrence Interval Tropical Cyclone (Years)	Hurricane (Number)	Reoccurrence Interval Hurricane (Years)
Corpus Christi (26° -29° N, 95° -98° W)	41	1.8	25	2.9
Galveston-Freeport (28° -30° N, 94° -97° W)	35	2.1	23	3.2
Sabine Pass (28° -30° N, 92° -95° W)	32	2.3	15	4.9
Bayou Lafourche (28° -30° N, 89° -92° W)	45	1.6	18	4.1
Southwest Pass (28° -30° N, 88° -91° W)	49	1.5	18	4.1
Mobile-Pascagoula (29° -31° N, 87° -90° W)	41	1.8	15	4.9

Source: U.S. Department of Commerce, NOAA, 1972.

Notes: Hurricane - tropical cyclone with sustained surface wind speeds of 64 kt. (74 mph) or more.

Tropical Storm - tropical cyclone with closed isobars and sustained surface wind speeds of 34-63 kt. (39-73 mph).

and storm intensity. The storm surge associated with "Betsy" in 1965 reached nearly 6.1 m (20 feet) at Bayou Lafourche (U.S. Dept. of the Army, 1973); Hurricane "Carla" in 1961, produced 7 m tides in Lavaca Bay, Texas. Hurricane "Camille" was the most severe hurricane in recent Gulf history, with top winds estimated at 324 km/hr, and barometric pressure in her eye as low as 68 cm (26.6 in.) of mercury. Anita, of late August 1977, came ashore just south of the U.S. border in Mexico after tracking through the Gulf, bringing storm surge to various parts of the Texas and Louisiana coasts. In the same week, "Babe", just strong enough to be termed a hurricane, developed and caused no significant offshore damage. It came ashore near Morgan City, Louisiana three days later.

(2) *Extratropical Cyclones*

In addition to the tropical cyclones, extratropical cyclones that may vary greatly in intensity occur in this area primarily during the winter months. These storms have attained wind speeds as great as 55 to 93 km/hr. They originate in middle and high latitudes forming on the fronts that separate different air masses. The Gulf of Mexico is an area of cyclone development during the cooler months due to the contrast in temperatures of the warm air over Gulf waters and the cold continental air over the United States. These storms rapidly dissipate, or move on, after entering the Gulf of Mexico.

(3) *Polar Outbreaks*

A phenomenon known as "norther" is quite common in the area in question during the winter months. A norther occurs when cold, polar air moves southward from the cold interior of the North American continent out over the warm waters of the Gulf. This unstable cold air mass, when heated from below, develops strong gusty northerly winds, with considerable cloudiness and showers. During a typical winter as many as 30 such Polar outbreaks reach the Gulf Coast. The majority of these cold outbreaks, spilling out over the Gulf, produce winds in the 28-37 km/hr range but approximately one-third of these cold outbreaks have winds over 62 km/hr with approximately half of these being vigorous enough to reach 89 km/hr (U.S. Dept. of Commerce, 1967).

3. Physical Oceanography

A. CIRCULATION

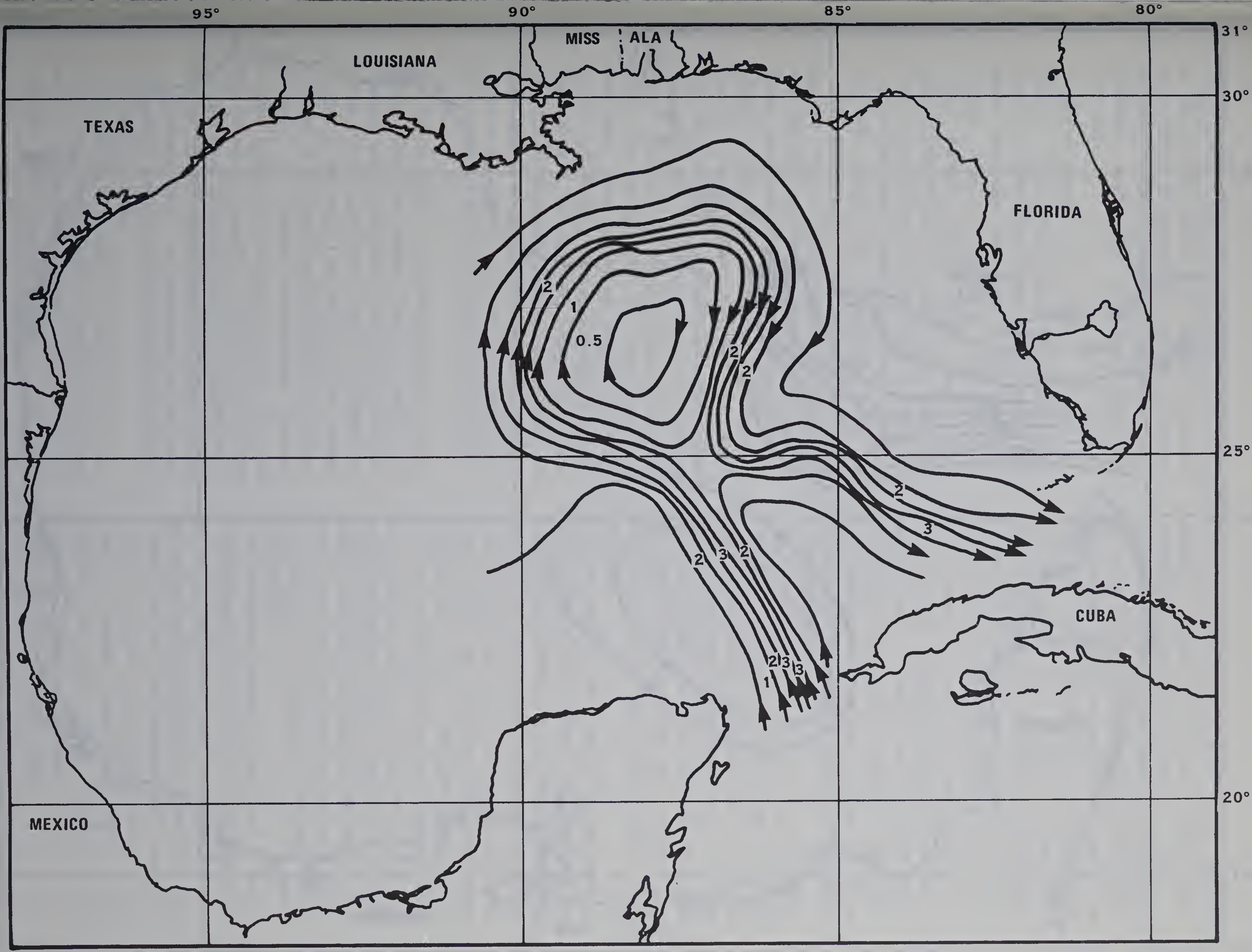
(1) *Loop Current*

The complex circulation in the Gulf of Mexico is dominated by the Loop Current. In general, the large scale circulation in the Gulf of Mexico is attributable to four major factors: Yucatan Currents, tides, winds, and river discharges (Eleuterius, 1974). Eddy currents off the major loop probably account for northern growths of coral such as the Florida Middle Grounds, offshore Florida, and the Flower Garden reefs, offshore Texas. Current trajectories in the Gulf have been mapped for many years by the Naval Oceanographic Office (1955). Surface Current Wind Roses for the Gulf of Mexico are shown in Visual No. 6. Additional Loop Current data are contained in: USDI, GS (1975), Eleuterius (1974), Sweet (1974), and Molinari, et al. (1977).

The Loop Current is a major feature of the Central and Eastern Gulf. It is a continuation of the Yucatan Current that enters the Gulf of Mexico through the Yucatan Straits. Although the current shows great annual and seasonal variability in magnitude and course, in general, it penetrates some distance into the Gulf, turns clockwise and exits through the Florida Straits. The path of the Loop Current appears to be directly influenced by the topography of the Gulf of Mexico Basin (Submarine Physiography Visual).

The northward progression of the Loop Current varies from the edge of the continental shelf off the Mississippi River in August to the southeastern Gulf in mid-winter. During spring and summer current speeds in the core of the current approach 0.25 m per second (figs. 21 and 22).

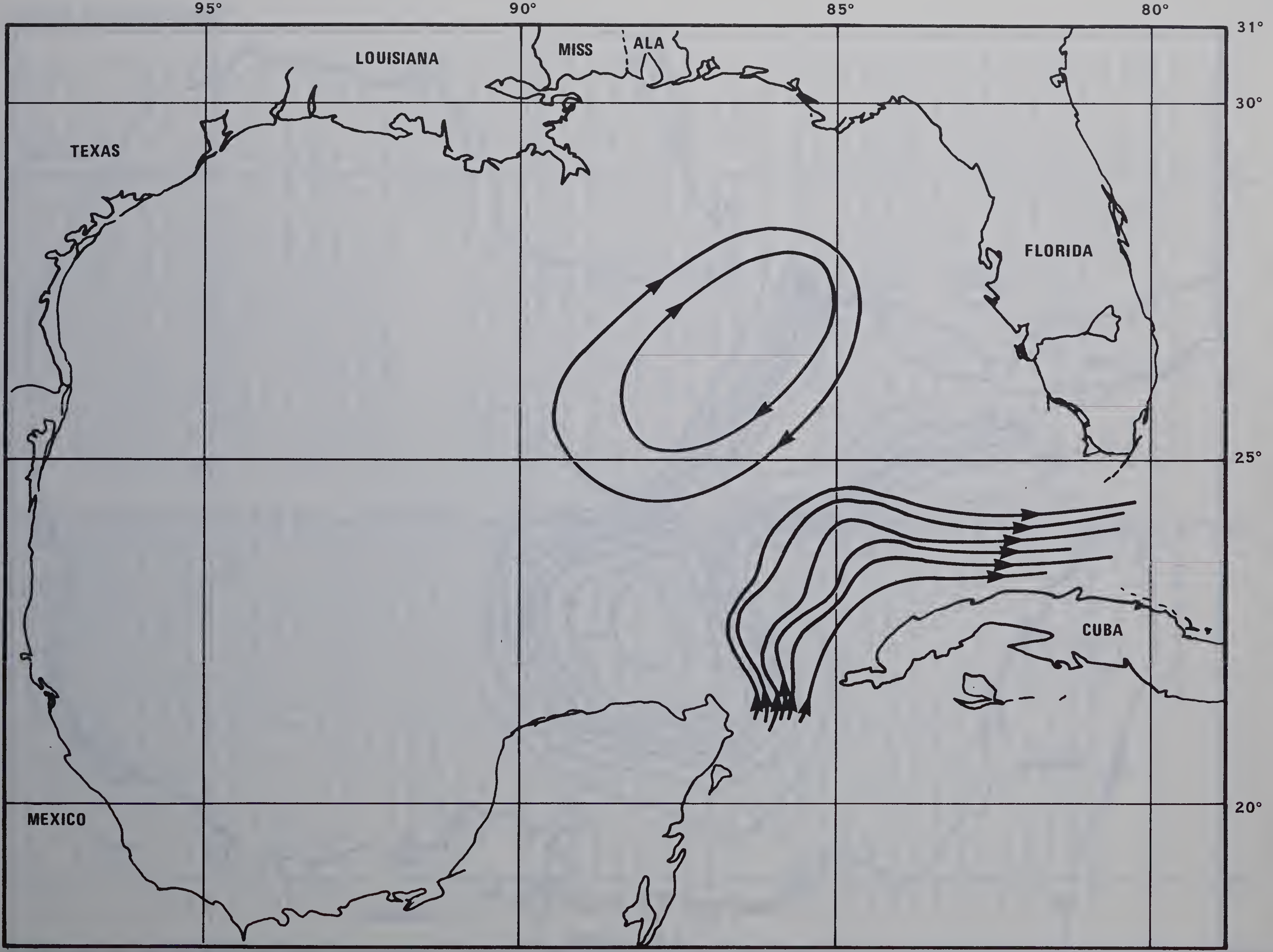
Large eddies frequently separate from the main current and drift into the western Gulf, these spin-offs decay over a period of three to six months (Eleuterius, 1974). No significant permanent or semi-permanent shelf currents exist in the western Gulf as a result of the Loop Current. Figure 21 shows the northerly extent of the current parallel to the continental shelf of east Louisiana, Mississippi, Alabama, and Florida. An eddy is in the process of being formed on the western loop boundary and will eventually drift westward. The intensification on the loop can be seen as streamlines constrict thus causing velocities to increase. The streamlines represent a certain volume passing through a plane perpendicular to



SOURCE: ELEUTERIUS (1974)

FIGURE 21 LOOP CURRENT, AUGUST

FIGURE 22 LOOP CURRENT, DECEMBER



SOURCE: ELEUTERIUS (1974)

the contours in a given time, therefore velocities must increase to maintain this volume of flow as streamlines constrict. Figure 23 represents a fully developed eddy with associated transitional streamlines.

(2) *Surface Circulation*

Figure 24 depicts surface circulation trends along the Louisiana coast, emphasizing the general westward movement of currents. The nearshore regime in this area is influenced by several factors, among them winds, tides, offshore current flow and fresh water discharge from coastal rivers. In most areas significant winds are the major control of surface currents.

Currents around the Mississippi Delta are strongly influenced by the fresh water outflow from the river. At Head-of-Passes the Mississippi River branches into three major channels: Pass-A-Loutre, transporting 31.5 percent of the total river discharge; South Pass, 17 percent and Southwest Pass, 31.5 percent (Dept. of Army, 1976). Fresh water discharge rates vary seasonally with highest values occurring during the spring and lowest in the fall. Outflow from the Mississippi Delta maintains its general integrity as it passes over the more dense, saline underlayer. Scruton (1956) observed a fresh water plume extending 20 km off Pass-A-Loutre. This has been confirmed by Eleuterius (1974) whose data indicate that at times this plume extends some 64 km eastward. Fresh water plumes to the south and west are less well known, however, they undoubtedly exert considerable influence.

In the vicinity of the Mississippi River Delta surface salinities range from 0.0 parts per thousand (ppt) to 36.0 ppt, in a distance of 16 km. During winter, high salinity cells are a permanent feature of the area. Low-salinity waters spread eastward of the shelf during spring and summer. Similarly, in winter temperatures increase seaward from 10° C nearshore to 22° C at the shelf break. In summer, temperatures decrease seaward from an extreme of 33° C nearshore to 29° C at the shelf break. These two factors, salinity and temperature, are responsible for the density gradients that exist over the shelf near the Mississippi River Delta.

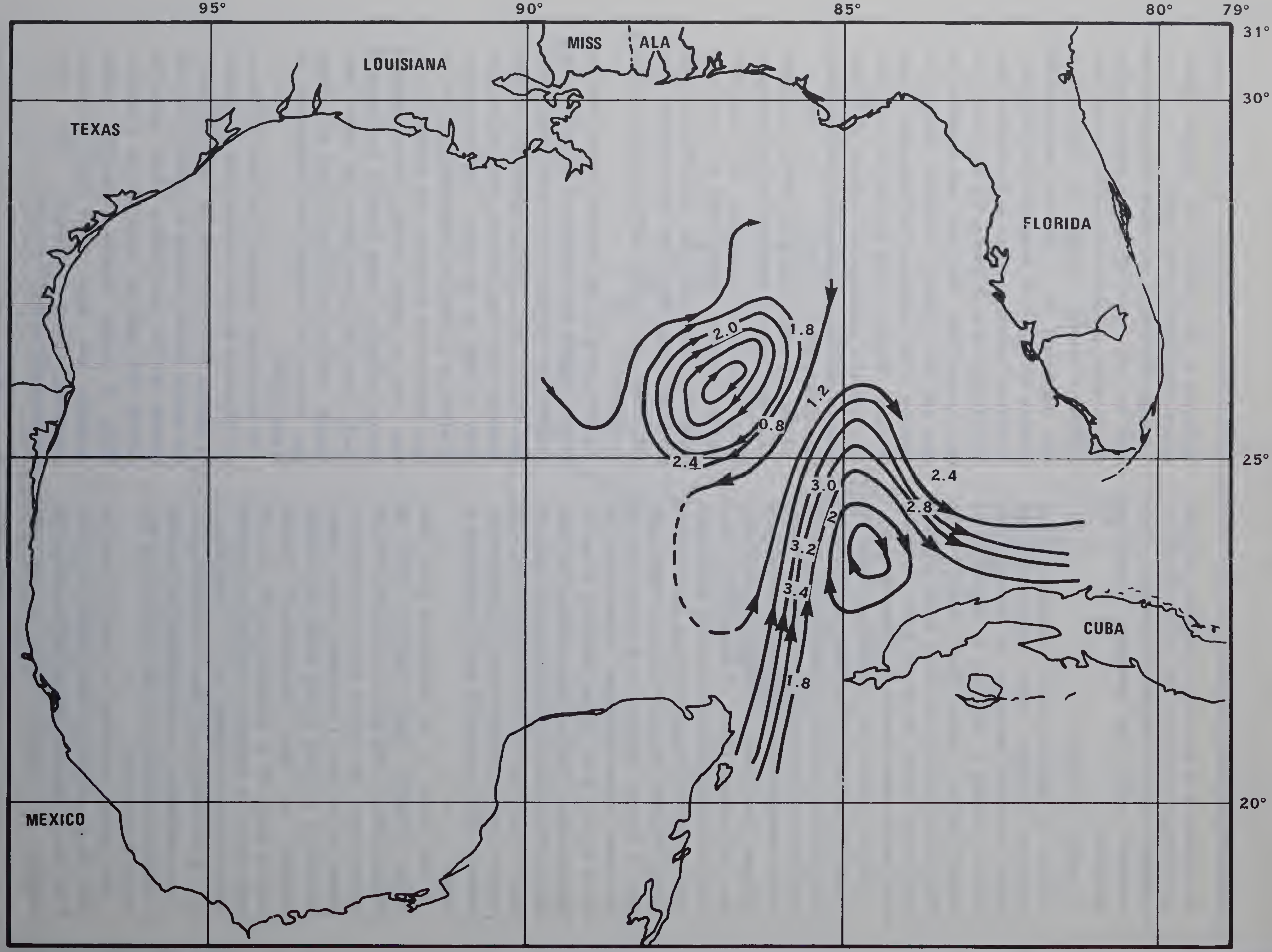
Wind driven circulation is caused by the frictional drag produced as wind passes over water. Wind stress, applied at the sea surface causes net transport of subsurface water at an angle (deflected to the right in the Northern Hemisphere) proportional to the depth.

Surface currents in the South Texas proposed lease area shift seasonally and, in general, reflect the prevailing winds over the area. Currents from September through February are southwesterly with indications of a southerly alongshore or offshore movement in November and December. A period of transition occurs in March-May when currents shift to west then to the northwest. Surface current flows north and east alongshore in June and July. Finally, in August, currents are westerly before resuming the September regime (U.S.D.C., NOAA, 1976). Analysis of drift bottle data indicates three current systems off Texas; inshore, shelf, and oceanic during the March-May transitional period.

There is a general westward sweep of currents along the Louisiana shelf west of the Mississippi Delta. This current continues as a southerly-oriented boundary current along the west Louisiana and Texas coasts (fig. 25) until it reaches the South Texas area. This table however does not reflect the strong month-to-month current changes.

Studies done by the National Marine Fisheries Service indicate the existence of a zone of convergence that develops in the waters of the inner and middle shelf. This convergence is most pronounced in spring when the nearshore location tends to shift up the coast. The convergence develops as a result of contrasting direction of flow between the nearshore and offshore water. This zone is absent during winter (October through February) when currents are predominantly west and south across the entire shelf. Density structure and wind are also very important factors in forming the currents in the Western Gulf.

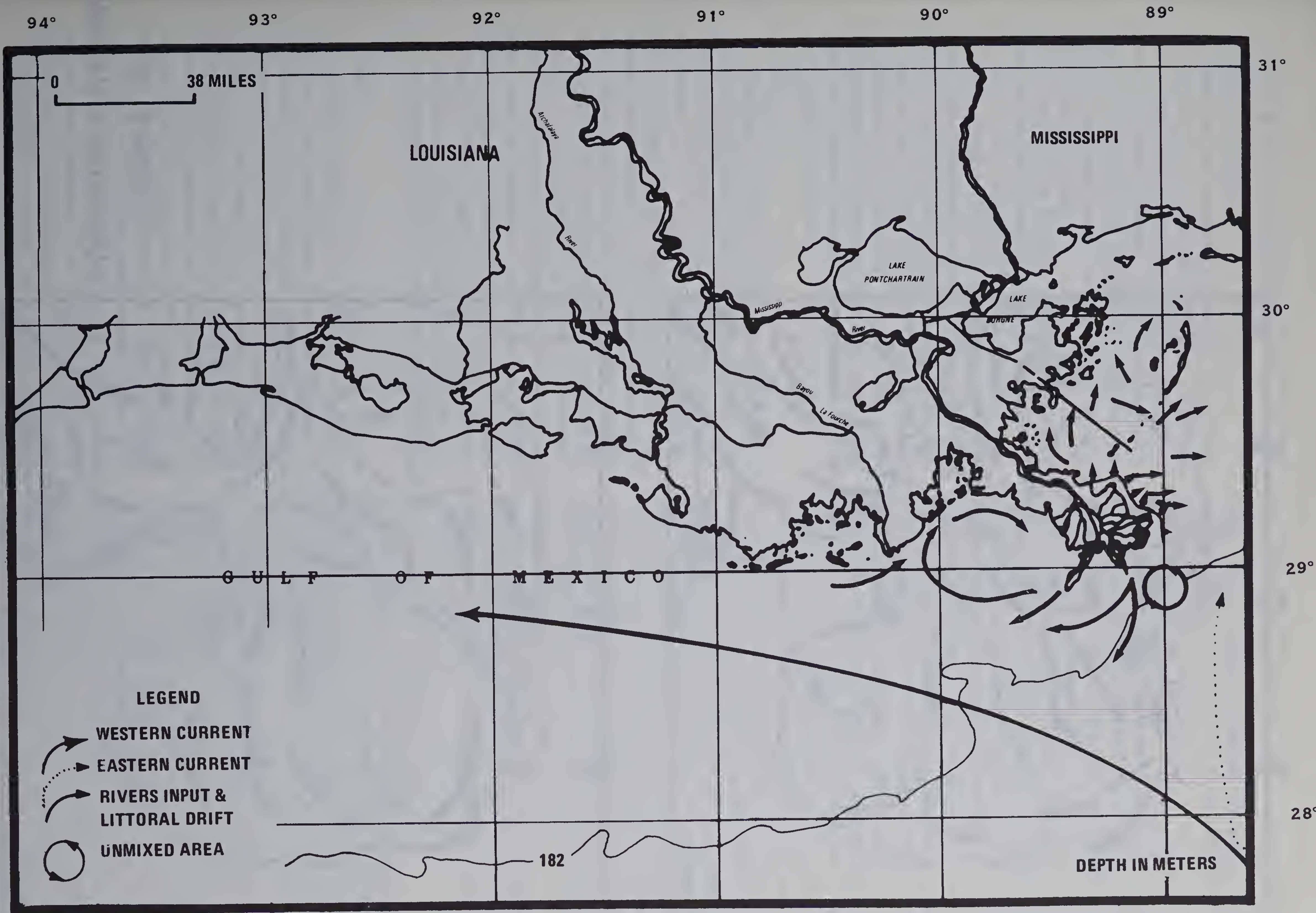
In conclusion, currents in the Gulf of Mexico are influenced by wind in the western portion and by density differences and the Loop Current in the eastern portion. During the summer the Loop extends far into the northern Gulf causing an easterly flow past the slope off the Mississippi Delta. A counter current caused by density gradients and wind stress flows westward nearshore along Louisiana and turns southwesterly on the Texas shelf.



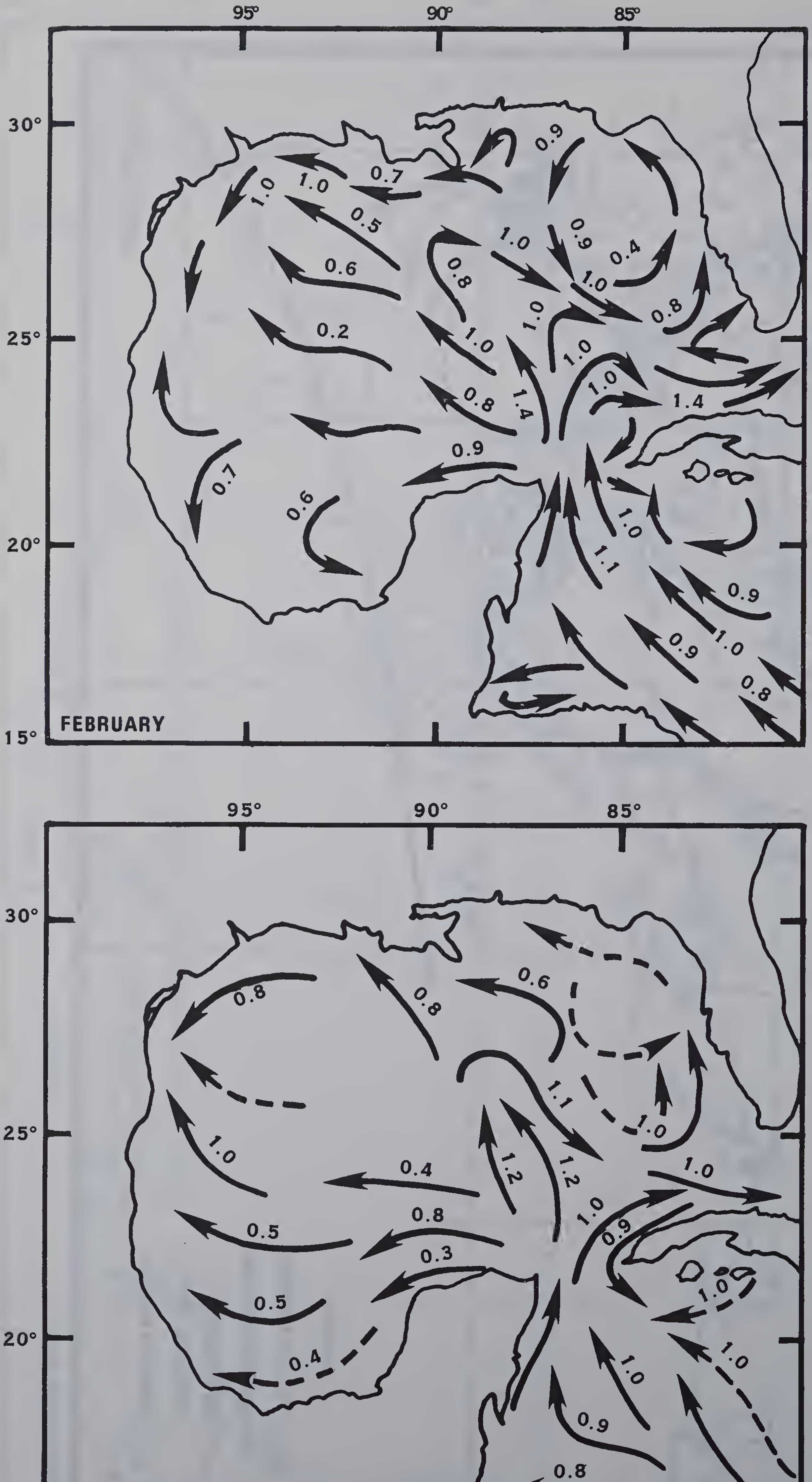
SOURCE: ELEUTERIUS (1974)

FIGURE 23
LOOP CURRENT, JUNE

FIGURE 24
SURFACE CURRENTS



SOURCE: STONE, 1972



SOURCE: NOWLIN, 1971
NOTES: CURRENT SPEED IN KNOTS

FIGURE 25
SURFACE CURRENTS

(3) Bottom Circulation

Several recent monitoring efforts in the eastern Gulf of Mexico have shown there may be no apparent relationship between surface currents and bottom currents. Although current measurements on the shelf bottom are feasible, they are so rare that very few conclusions can be drawn concerning circulation patterns.

The South Texas Baseline Study has provided some information regarding bottom currents on the Texas shelf. Surface drift was found to correspond to bottom drift during early fall and midwinter. The transitional periods of spring and late fall showed no relationship between bottom and surface currents (USDC, NOAA, 1976). A bottom convergence zone was found several miles south of the surface convergence zone and other occasions the bottom convergence zone was found north of the surface area.

B. TEMPERATURE

According to Leipper (1954b), the main feature of the average winter sea surface temperature for the Gulf of Mexico is a gradual drop from approximately 24° C in the south to 18° C in the north in all parts of the Gulf. In the summertime, average temperatures are very nearly uniform at 29° C throughout the Gulf. In the colder months there is a strong onshore-offshore temperatures gradients over the shelf area. Years of investigations have shown that considerable deviation from these average isotherms may occur at certain times. In shallow coastal waters and in estuarine and marsh areas, water temperatures approximate air temperatures, but without reaching the extremes exhibited by air temperatures on short term.

C. TIDES

The tides of the Gulf of Mexico are weakly developed and usually their observed range does not exceed 0.7 m (Durham and Reid, 1967). Semidiurnal (twice daily) tides are small, and therefore, overall tides in the Gulf are considered diurnal (daily) in character. In 1897, R. A. Harris (Grace, 1932) suggested that the diurnal tides of the Atlantic Ocean influences the tides in the Gulf through the Yucatan Channel. A single oscillating system with a nodal line extending from western Haiti to Nicaragua is formed by the Gulf of Mexico and the Caribbean Sea. This causes the tides of the Gulf to be simultaneous. The Gulf and the Caribbean Sea is viewed as a single oscillating body with a period of nearly 24 hours. Tidal regimes for the Gulf of Mexico are presented in Figure 26.

In 1908, C. Wegmann (Defaunt, 1961) considered the resonance effect of the diurnal components of the Gulf tides and found the period of free oscillation for an east-west oscillation to be 24.8 hours. According to Grace (1932) the diurnal tide enters through the Florida Straits, progresses counterclockwise around the basin, is reflected by the northwestern and southern coasts and egresses through the Yucatan Channel.

When the moon is near its maximum declination, the tide is diurnal and has the greatest range. When the moon is over the equator, the tide has the least range and there may be several days having two highs and two lows. Although tides in the Gulf have a small range they do have important roles in modifying currents and accelerating the movement of water through narrow passages.

Spring tides are slightly higher, but since the range is too small, meteorological effects can completely mask tidal fluctuations (U.S. Dept. of Commerce, 1967). For instance, an onshore wind can pile-up water against the coast to a height of 1.2 m above mean sea level. Tides are diurnal (one high and one low per day), with maximum ranges recurring about every two weeks (Stone, 1972). Highest mean water level occurs during the period December through March.

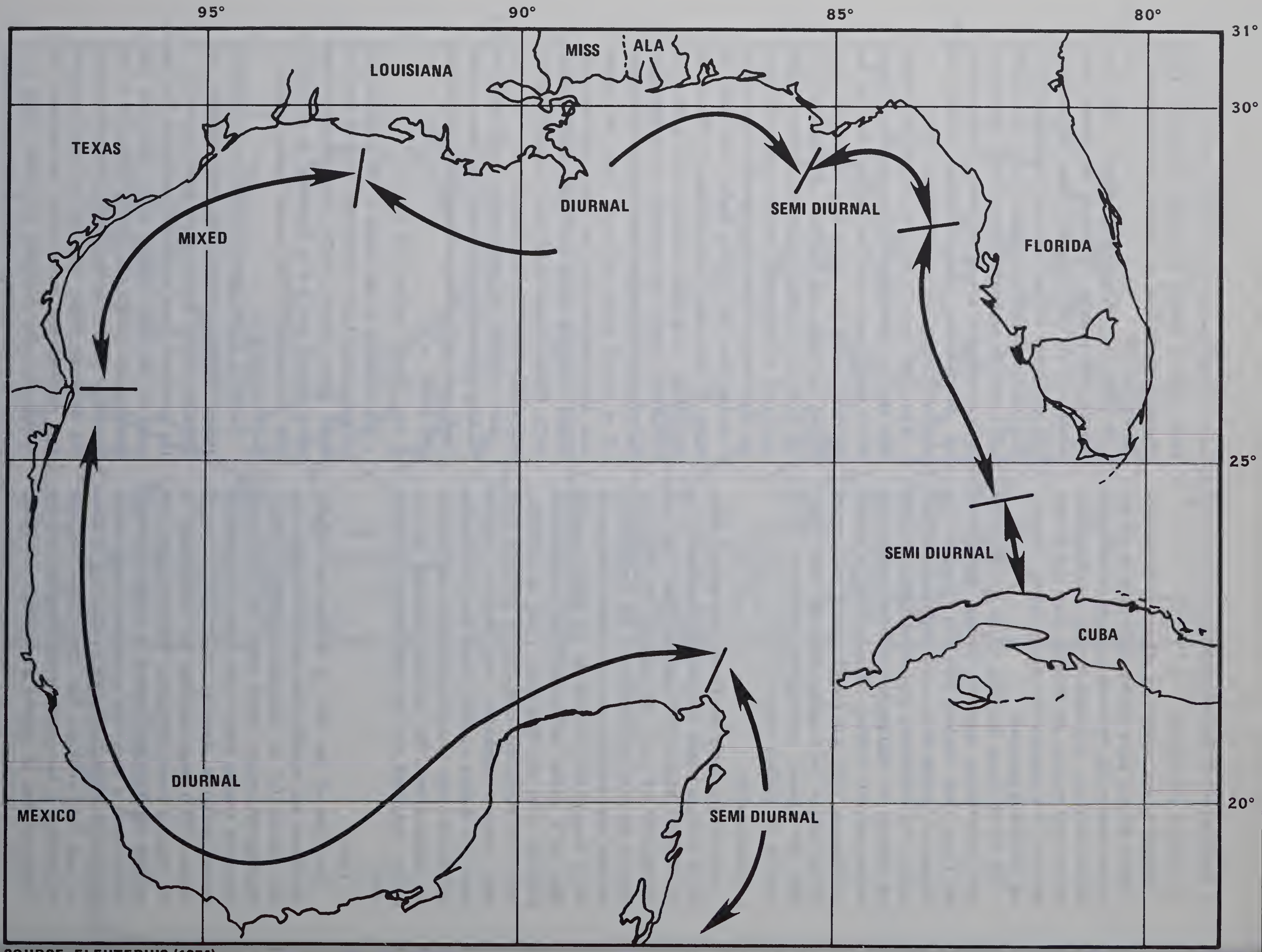
Tidal currents do have some small effect on flushing rates in enclosed bays, but because tidal ranges are small, currents resulting from tides are also small.

D. SEA, WIND, WAVES AND SWELLS

The coastline of the region of the proposed sale is characterized as a low energy area in terms of wave power (Stone, 1972). The annual average wave heights are 0.9 m (Brower, et al., 1972), with 75 percent of all waves being smaller in height than 1.5 m.

Direction and height of waves at an offshore station closely correlates with wind direction and intensity. On an annual basis waves come out of the northeast, east, southeast, and south 70.9 percent of the time (Stone, 1972). July and September data reflect the strong influence of the southerly winds resulting from circulation around the Bermuda High. The shift to more northerly and northeasterly wave origin accompanies the change in wind direction in winter when it is

FIGURE 26
TIDAL REGIMES



SOURCE: ELEUTERIUS (1974)

dominated by continental air masses and "northers". From May to August 80 percent to 90 percent of the waves were 1.5 to 2.4 m in height, and less than one percent exceeded 3.7 m in height. Waves from the northeast and southwest tend to have greater heights than those from other directions.

Stone (1972) reported that wave power along the coast is less during spring and summer and greater during autumn and winter by a factor of 2 or 3.

The wind velocity, the distance over which the wind blows (fetch), and the length of time that the wind blows (duration) all have a direct effect on wave growth. In general, any increase in one of these factors will result in larger waves. Sea is a term applied where waves are actively being generated. Swell refers to long period uniform waves some distance from the generating influence.

Prevailing winds during spring, summer and early fall are from the southeast and wave heights are generally less during this period. Waves associated with storms range considerably higher. During hurricane "Camille" in 1969, for example, waves 21 m high were reported offshore, with winds exceeding 322 km/hr. Table 8 gives an estimate of high wave occurrences for three areas of the Gulf coast.

Due to the Coriolis effect sea breezes rotate clockwise in the northern hemisphere during a 24-hour period. Usually the sea breeze will start around 1000 hours, reach a maximum at 1400 hours and afterwards be replaced by the nocturnal land breezes. To provide information on amplitude phase and frequency of responding waves, currents and beach erosion and deposition, a fully instrumented project was undertaken on Santa Rosa Island, Florida, by Sonu, et al. (1973). Their results demonstrated that sea breezes significantly affected the dynamic processes operating on the coast in the following summary:

(1) Meteorological parameters such as aerodynamic roughness, shear stress, and atmospheric stability exhibited definite coupling with the wind speed. A new relationship between the friction velocity and the wind speed at 10 m was found; this new relationship contrasts with conventional deepwater expressions. The aerodynamic roughness depended not only on waves, as was expected, but also on atmospheric stability mainly associated with land breeze.

(2) The sea breeze produced a high-frequency peak in the nearshore wave spectrum that dominated the background swell in the afternoon and evening. The response of the wind waves involved amplitude, frequency and direction, whereas that of the swell was primarily limited to amplitude.

(3) Nearshore currents responded with a lag of 3-5 hours to the onset of the sea breeze cycle with current amplitudes of up to 25 cm/sec. As a consequence of the proximity of the coast and the surface slope associated with wind setup, these currents flowed essentially parallel to the shoreline and had only minor onshore-offshore components.

(4) Wave-induced currents around and inside the inner bar underwent systematic diurnal variations in response to offshore wave breaking and incident angles of the diurnal wave field, changing from closed circulations (early afternoon), to meandering currents (late afternoon), to weakly curved parallel currents (night and early morning).

(5) The beach system acted as a low-pass filter to input waves, so that both swash and groundwater fluctuations underwent high-frequency attenuation. The cutoff frequency varies as a function of the combined effects of the tide and diurnal wave field.

(6) Topographic response exhibited dependence on the scale of topography and excitation frequency. Whereas small-scale features such as ripples, megaripples, and beach cusps changed within an hourly or shorter time scale, large features such as crescentic bars and rhythmic shorelines on the order of 120 m in wavelength remained unresponsive for over three weeks.

4. Chemical Oceanography

A. NUTRIENTS

In the marine ecosystem phytoplankton constitute the primary producers and as such are dependent on an adequate supply of three essential nutrients: nitrogen, phosphorous and silica. The primary sources of supply of these nutrients are upwelling of deep waters, advection and discharge from land sources (rivers, industrial and domestic sewerage). The primary process depleting the concentration of nutrients in the surface water is rapid uptake by phytoplankton and consequent removal of the phytoplankton by predation or by sinking. As a result, only low concentrations of nutrients are normally found in surface waters except in local source areas.

Major source areas of turbidities are the rivers and bay outlets into the Gulf of Mexico, principally the Mississippi and Rio Grande rivers. Organic content of the water is high bordering south Louisiana and Texas. A nutrient analyses of waters in the eastern Gulf of Mexico have recently been completed (Fanning, 1974). He reports on five of the most common dissolved nutrients (nitrate, nitrite, silica, phosphate and arsenate). Results show low surface and intermediate values and high bottom enrichment. Fanning (1974) rejects upwelling as the cause of the bottom enrichment and favors this enrichment from release of the nutrients from bottom sediments through diffusion or seepage, although the intermediate and surface nutrient values could be caused by uptake by benthic algae.

Table 8
Occurrence of High Waves in the Gulf of Mexico

Area	Reoccurrence Interval (Years)	Significant Wave Height* (m)
Southwest Pass (28° -30° N, 88° -91° W)	5	9.5
	10	10.4
	25	11.9
	50	13.1
Mobile-Pascagoula (29° -31° N, 87° -90° W)	5	9.5
	10	10.4
	25	11.9
	50	13.1
Panama City (28° -31° N, 84° -87° W)	5	9.5
	10	10.4
	25	11.9
	50	13.1

Source: U.S. Department of Commerce, NOAA, 1972.

Notes: *Indicates the approximate height of one-third of highest waves observed. There may be higher waves in the wave field called extreme waves that can be estimated by applying a 1.8 factor to the significant wave height. However, in most cases extreme wave heights are limited to a value of one-half the water depth.

b. SALINITY

The salinity patterns of the Gulf of Mexico (fig. II-17) are principally determined by: inflow of ocean waters through the Yucatan Strait, precipitation and inflow of fresh water from land sources, evaporation, circulation and mixing and outflow through the Straits of Florida. In the northern Gulf, runoff from the Mississippi, Atchafalaya and from smaller rivers to the east and west gives rise to a band of low-salinity water (Nowlin, 1972). Seasonality is known to strongly influence nearshore-offshore salinity gradients.

In the upper 50 m, water in the central Gulf of Mexico typically has a salinity of very near 36.0 parts per thousand (ppt) (Leipper, 1954b). The distribution of surface salinities in the winter is generally lower. A similar distribution pattern, but with generally higher salinities because of high evaporation rates, is found for summer conditions. In the eastern Gulf these distributions are modified by the seasonally dependent Loop Current (Sackett, 1972).

c. TRACE METALS

The trace metals that usually occur in the marine environment include cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, iron, uranium and zinc. These occur in concentrations normally less than one part per million (ppm). These metals can enter the marine environment through weathering of rocks or by pollution discharge caused by human activities.

Analyses of sediments to determine concentrations of heavy metals were made by Berryhill (1975 a & b). The following conclusions have been drawn from this study.

As a regional pattern, the trace metals content of sediment in estuaries are relatively higher than in the sediments of the continental shelf.

Compared to the average trace metals content for the south Texas OCS as a whole, only cadmium and manganese are significantly high. For several trace metals, including cadmium, the highest concentrations are in the area of suspected gas seeps along the outer edge of the shelf in the northeastern part of the OCS.

The suspected gas seeps appear to be emanating upward along fault planes and may be depositing trace metals in the sea floor sediments, thus explaining the higher concentrations of some trace metals there.

In the south Texas OCS, the average levels for all trace metals determined are lower than the average levels for the segment of the northwestern Gulf shelf immediately to the north. For the overall northern Gulf of Mexico continental shelf, the average levels within the south Texas OCS are comparable.

A most intensive study of trace metals in the Gulf was completed by Corcoran (1972) for six trace metals: Cd, Pb, Cu, Cr, Zn and Mg. Except for copper, the concentration of the five other metals was ten times the concentration typically observed in open ocean waters. Also, manganese was higher than concentrations reported by Rona, et al. (1962). This seems to indicate enrichment of trace metals by the Mississippi River and from Escambia and Perdido Bays. The most complete data on Alabama's coastal area was compiled by May (1973) from water samples collected in Mobile Bay and Gulf waters within six miles of offshore Alabama.

Trace metals were most recently determined in conjunction with MAFLA investigations for the central and western Gulf of Mexico (Florida Board of Regents, 1976). Results are summarized in Table 9. Areas IV and V represent findings on metal concentrations offshore from Alabama and Mississippi. These studies along with others indicate that coastal waters have an order of magnitude greater concentration than open ocean waters.

When adequately sampled it appears that trace metal data can complement or reinforce circulation information and can indicate dynamic characteristics. Evidence of this is discussed in *A Summary of Knowledge of the Eastern Gulf of Mexico* (Jones, et al., 1973) as follows:

An examination of the distribution of trace metals in Escambia-Santa Rosa counties indicates that water movements are complex. There seems to be a general movement of surface waters from east to west. Salinity, silicate and manganese data indicate a surface flow of water out of the bays, yet the trace metal data show an offshore enrichment with no apparent surface connection. This would indicate that the trace metals are carried below the surface upon their entrance into the Gulf, only to rise again a few miles away in small divergent areas, or they are entrapped within the bays and their offshore enrichment comes from the Mobile Bay and Mississippi River sources, or the surface waters are enriched by

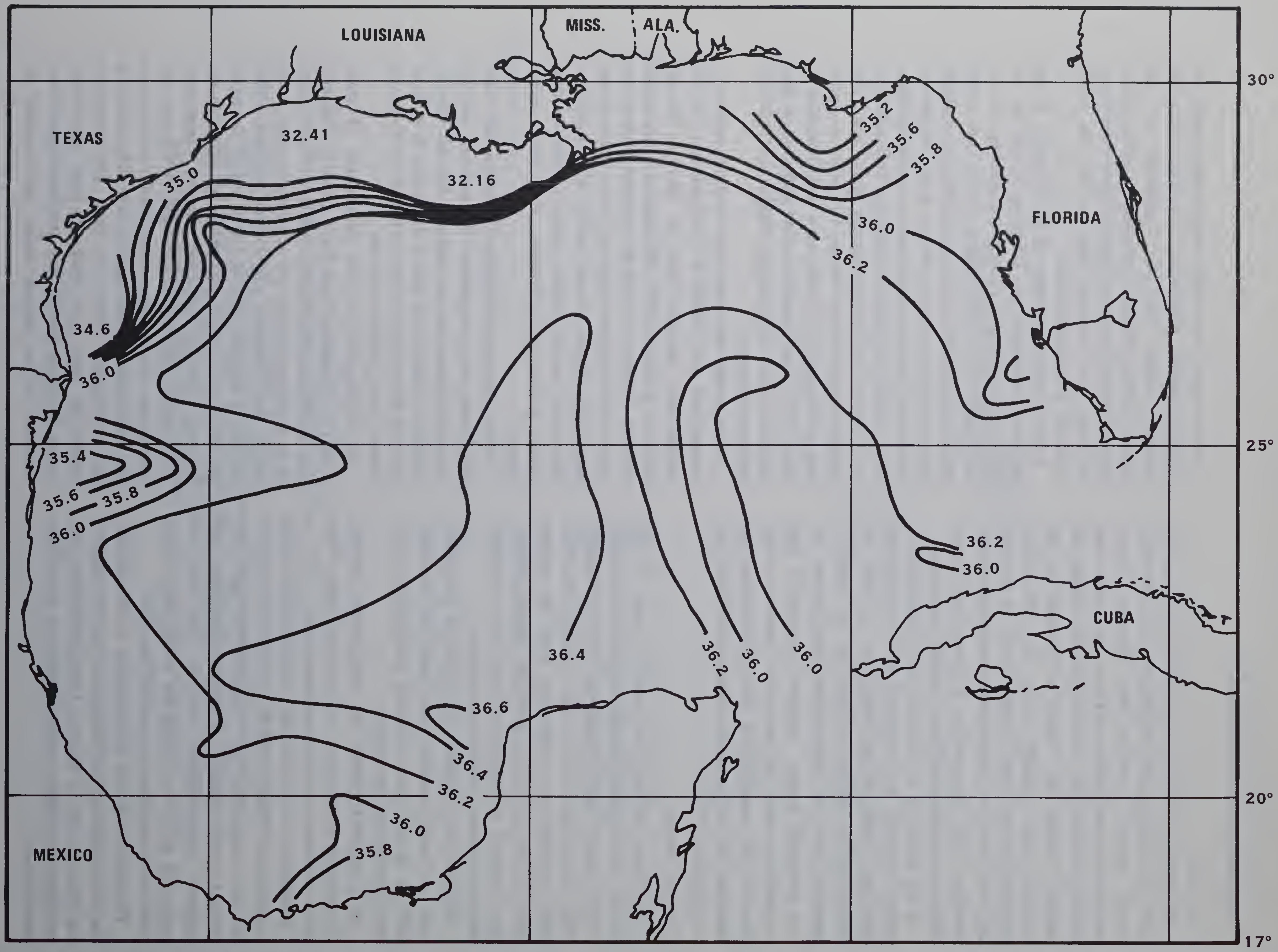


FIGURE 27
SURFACE SALINITIES

SOURCE: HIDALGO,
NOTES: SALINITIES IN PARTS PER MILLION (PPM)

Table 9

Heavy Metal Concentrations in Sediments

Element (SD)	Area I	 II	 III	 IV	 V	Carbonate Rocks	Nearshore Sediments
Fe (%)	.16 (.04)	.16 (.08)	.52 (.19)	.66 (.51)	2.01 (1.11)	.4	3.5
Cd (ppm)	F.05 (0)	F.07 (.02)	F.09 (.05)	F.08 (.03)	F.2 (.08)	0	0
Cu (ppm)	.4 (.6)	4.4 (1.3)	4.9 (2.7)	4.5 (3.8)	10.5 (7.1)	14	48
Cr (ppm)	18 (5.4)	13 (6.8)	19 (7.5)	16 (20)	39 (23)	11	100
Ni (ppm)	2 (2)	3 (1.5)	4.5 (1.9)	4 (2.7)	17 (13)	12	55
Pb (ppm)	6 (1.3)	3.5 (1.8)	6 (1.6)	7 (2.7)	13 (6.5)	8	20
V (ppm)	5 (1.5)	6 (4.5)	10 (4)	13 (7)	56 (37)	15	130
Ba (ppm)	49 (15)	46 (12)	68 (31)	76 (39)	339 (213)	150	750
Samples (Number)	9	8	20	10	10	-	-

Source: Florida Board of Regents, 1976.

Notes: (SD) - standard deviation.

wind-carried aerosols. Possibly all three processes contribute. Sediment studies seem to indicate bay entrapment, but it is also well known that trace metals are released from sedimentary particles upon contact with saline water, and it is also well known that trace metals (especially lead) are constituents of the aerosols.

Slowey and Hood (1969) have reported high trace metals content at intermediate depths in Gulf water. They found this metal content at intermediate depths to decrease as the water moved through the Gulf of Mexico and concluded the metal origin to be from outside the Gulf, either from residual sub-Antarctic intermediate water, or from a continual rain of decaying organisms with their resultant release of metals during the northward transit of the water. The outside origin of high metal content of intermediate water seems reasonable and feasible. However, the conclusion is based on the resemblance of copper, manganese and zinc distributions in the Gulf to those found at one station taken from Cuba.

A map of trace metals for the Gulf of Mexico sediments has been proposed by Holmes (1973) from a semiquantitative analysis of sediment samples taken mainly from NMFS Geronimo cruises. Holmes (1971) has prepared a detail map of zirconium distribution in the northwestern Gulf from Galveston to beyond the Flower Garden Banks (fig. II-18). His analyses indicate that the highest trace-element concentrations are in regions of the shelf that are actively receiving sediments. The zirconium concentrations are an exception because they are deposited in areas of slow deposition along the elongate bathymetric features in offshore Texas. This correlation of zirconium concentration to the elongated features suggests that the topographic features are ancient shorelines that have been submerged during the past Pleistocene rise in sea level. (USDI, BLM, 1976).

D. LIGHT HYDROCARBONS

Considerable study has been made of the origins and distribution of low molecular weight hydrocarbons in Gulf of Mexico coastal waters (Brooks and Sackett, 1973; Sackett and Brooks, 1975; Bernard, et al., 1976; Brooks, undated). These works indicate that light hydrocarbons in the surface waters of the open Gulf are nearly constant, but concentrations on the continental shelf show great regional variations; much of the upper gulf coast is supersaturated with respect to methane and other light hydrocarbons; and much of this supersaturation comes from man-made sources, particularly two standard operating procedures of the oil and gas industry: (1) under water venting of "waste" gases and (2) the discharging of co-produced brines. Approximately 1.7 x 10 liters of gas were vented and/or flared in the Gulf of Mexico during September, 1974 with roughly 70 percent of this amount vented underwater. The hydrocarbon inputs via natural seeps are apparently negligible compared to man-derived inputs, estimates of which indicate that up to 450 metric tons of C_5 to C_{10} hydrocarbons are being added to Louisian shelf waters each year. Loss to the atmosphere is the primary fate of these hydrocarbons.

B. Biological Environment

Louisiana—Final Environmental Statement, Vol. 1, OCS Sale No. 36. Texas—Final Environmental Statement, Vol. 1, OCS Sale No. 37. Gulf of Mexico General Lease Sale—Final Environmental Statement, Vol. 1, OCS Sale No. 41.

1. Phytoplankton

Phytoplankton sampling in the northern Gulf of Mexico has been sparse, intermittent, and mostly unquantitative. The studies which have been made pertain only to the presence of certain species in given areas. Thus, it is difficult to recognize seasonal fluctuations or geographic shifts in phytoplankton abundance or species succession (Pequegnat, et al., 1976). El-Sayed and colleagues (1972) plotted distributional patterns of the most common phytoplankton. This report, however, largely leaves out numbers and seasonal distribution of the organisms.

In comparison with other data recorded for different parts of the Gulf the total cells per liter listed in El-Sayed et al. (1972) are comparable. As might be expected the Eastern Gulf is a somewhat more productive area. Saunders and Glenn (1969) found a decrease from an annual average of 1.1 x 10^6 cells per liter at the shore to 8.5 x 10^3 cells per liter off the western coast of Florida. Under normal circumstances diatoms greatly outnumber the dinoflagellates. The dominant organism found in the Sargasso Sea is a coccolithophorid. This corresponds with the observation that a change from a coccolithophorid dominated flora to one dominated by diatoms occurs in the shallower

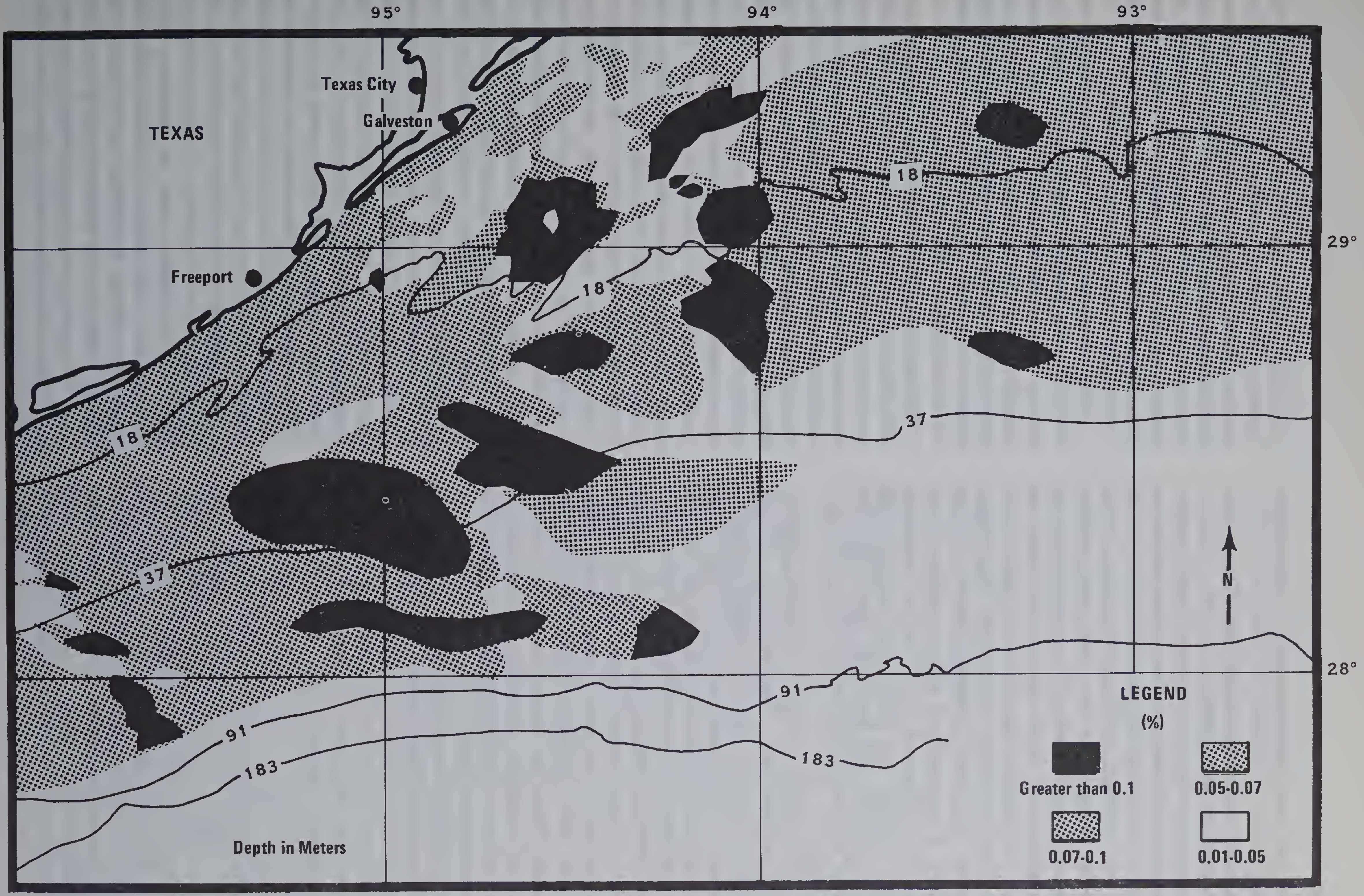


FIGURE 28
DISTRIBUTION OF ZIRCONIUM

water over the continental shelves (Van Baalen, 1976).

For the Texas Continental Shelf, Van Baalen (1976) reported the following:

> Yearly averages along the Texas transects were 4.1 x 10^5 cells per liter at the inshore stations, 7.8 x 10^4 at the middle stations, and 2.6 x 10^3 offshore. The yearly averages were greatly affected by the very large numbers found during the spring. The spring average for all stations and depths was 4.7 x 10^5 cells per liter. The summer and winter averages were 1.1 x 10^4 and 4.9 x 10^3, respectively. The summer average is a little misleading because of large counts at a couple of inshore stations. More than half of the stations (14) during the summer cruise showed less than 1,000 cells per liter. Winter samples on the other hand were consistent with very little variation from inshore to offshore.
>
> Approximately 35 species and 26 genera of phytoplankton were identified in an area offshore Louisiana that was studied during the planning of the deepwater port (LOOP, 1975); this area is approximately 69 km (43 mi) west of the mouth of the Mississippi River. It was not possible to characterize any of the offshore areas sampled based upon known salinity preferences of the species found. While marine species were observed at almost all sampling stations, estuarine species were also found in the same samples, indicating the variability of the area and a strong influence of freshwater sources on the biota.
>
> A definite phytoplankton seasonality was indicated in the LOOP studies. Total phytoplankton density in samples of the study area ranged from zero to 30.5 x 10^3 cells per liter. The number of cells from the inshore stations was substantially greater than those from the offshore sites.

Simmons and Thomas (1962) sampled phytoplankton from the eastern Mississippi Delta and described two assemblages associated with salinity regimes. A low salinity regime of river water has an assemblage dominated by two species each of the genera *Cyclotella*, *Melosira* and *Navicula*. A higher salinity regime of Gulf waters had an assemblage composed of *Nitzschia seriate*, *Thalassiothrix frauenfeldii*, *Thalassionema nitzochioides*, *Skeletonema costatum*, *Asterionella japonica* and three species of *Chaetoceros*. This Gulf water regime near the fresh water plume has higher diversity due to mixing of fresh water and marine genera. Seasonality of species (presence and abundance) was more variable in the Gulf regime than in the river regime. In both areas, the lowest standing crops were noted in November. Dinoflagellates were minor constituents of the phytoplankton observed near the delta.

Offshore abundance levels of phytoplankton were greatest during June through August and lowest during the months of October through March. At the inshore stations the periods of greatest abundance were during October through March, while the periods of lesser abundance were during May through September.

The data from the offshore study area were collected during a period when the Mississippi River had been at flood stage twice within 13 months, and when extensive dredging operations in the winter of 1974 were being conducted at Southwest Pass. These two factors no doubt affected the nutrient concentrations and turbidity of the offshore stations, and may have resulted in less than typical results. Primary productivity could be inhibited or greatly reduced by increased turbidity, because only after the turbidity decreased would phytoplankton be able to respond to nutrient loads received from the river discharge.

Phytoplankton are important as the primary producers of the marine environment. As such they are the starting point in the marine food web, providing food for zooplankton, which in turn provide food for larger marine carnivores; man, as a harvester of a variety of marine fish and shellfish, is one of serveral animals at the "top" of the food web. In addition, phytoplankton play a significant role in the world's oxygen-carbon dioxide budget and, in ways as yet incompletely understood, also serve to detoxify (biodegrade) many pollutants found in the Gulf.

Unfortunately, it is impossible to generalize regarding the distribution of phytoplankton in the Gulf of Mexico. It is clear from the data that have been collected to date that concentrations of phytoplankton are distributed in patches of various sizes which move with the prevailing winds and currents. Other factors, poorly understood, affect the size and distribution of the patches, including availability of nutrients and grazing pressure. Thus predictions regarding specific locations of a patch or species at any given time simply cannot be made.

2. Zooplankton

Zooplankton comprise a major link between producers (phytoplankton) and higher trophic levels in the Gulf. The most abundant groups are the copepods (Raymont, 1963), and they and other planktonic crustacea seem capable of ingesting both phytoplankton and detritus particles, and thus are important in the marine food web, as other animals prey on them (LOOP, 1975).

Common copepod species found in neritic Gulf waters include calanoid copepods and cyclopoid copepods. *Acartia tonsa* is a dominant nearshore form in bays and estuaries, and is found less commonly offshore (Gillespie, 1971). Euphausiid crustaceans are also prominent members of the zooplankton assemblage. Possibly the most significant carnivores in the zooplankton are the chaetognaths (arrow worms). Copepods dominate their diet, but this may be attributed to a relatively high copepod abundance (Raymont, 1963). They also feed on fish and barnacle larvae. The genus *Sagitta* is common worldwide and is typical in the Gulf. Other common carnivores in the zooplankton include the ctenophores, medusae of various species, ostracods, cladocerans, mysid and amphipod crustaceans, heteropods, pteropods, salps, and pyrosomes. Another significant group of carnivores are the various larval and immature forms, both holoplanktonic (planktonic at all stages of its life cycle) and meroplanktonic (organisms which have planktonic reproductive stages), from several phyla. These include most of the crustaceans mentioned, the tunicates, echinoderms, cephalopods, ectoprocts, sponges, annelid and nemertean worms. Fish larvae are important carnivores, and the survival of larvae of commercial species has an obvious ecomonic impact.

During the LOOP (1975) studies, copepods were the most abundant members of the zooplankton population offshore in all sampling months, making up between 52 to 97 percent of the monthly totals, with an average of 79 percent. *Acartia* was the most numerous copepod genus at all sampling depths and its representation was rather constant at each depth. Overall, this crustacean made up 53 percent of the copepod population. It was followed in abundance by *Paracalanus* which comprised 28 percent of the copepods sampled.

Post-larvae of shrimp were encountered in small numbers during most monthly samples. The mean number of zooplankton was 23/1 (Ragan, 1975). It is unknown whether this value is truly representative of offshore plankton populations because it differs somewhat from other sampling studies (LOOP, 1975). Ichthyoplankton (fish eggs and larvae) make up a portion of the plankton; the distribution and abundance of the ichthyoplankton fluctuates seasonally.

Park (1976) reported the following for the South Texas continental shelf during his investigation for BLM: On the basis of 144 samples collected during three seasons, the zooplankton of the South Texas continental shelf waters were investigated to determine their abundance in terms of biomass and showed a consistent decrease seaward. This decrease was particularly pronounced in the spring and summer months when the zooplankton production was high at the shallow stations. This correlated with what was reported by LOOP (1975) and SUSIO (1976). The seasonal change of the zooplankton in both biomass and species composition was progressively extensive from the deep to shallow stations. Copepods were the most abundant group, comprising about 70 percent of the zooplankton by number. A total of 182 species of copepods were found, of which *Paracalanus indicus*, *P. quasimoto*, and *Clausocalanus furcatus* were most abundant.

Floating patches of sargassum provide food and habitat for a large variety of animals, many of which may not be normally associated with the surface waters of the open Gulf.

As with the phytoplankton, it is impossible to generalize about specific location and extent of concentrations of zooplankton due to the extreme patchiness of the phytoplankton, on which many zooplankters feed.

3. Nekton

Nekton are those animals which swim about essentially independent of wave and current action. Nekton in the proposed sale area are represented by five major groups—marine mammals, reptiles (marine turtles), fishes, cephalopod molluscs (octopus and squid), and natant crustaceans.

Nekton can be categorized two ways, vertically (position in the water column) and horizontally (distance from shore). Vertically, the nekton is usually separated into pelagic and demersal components. The horizontal categories are coastal and oceanic (high seas) nekton.

The most conspicuous nekters are probably the fishes. Table 9-A lists these aforementioned categories and some representative species in the SE categories. Many of the coastal fishes are estuarine associated, that is, estuaries or coastal marshes are utilized during some phase of their life cycle, usually as a nursery. The classic example is that the adult animal spawn in the ocean and the young migrate to the estuaries, which serve as nursery areas. As post-juveniles or subadults the animals emigrate back to the open ocean. Some prime examples of this are croaker (*Micropogon undulatus*), and pink, brown and white shrimp (*Penaeus*). Rodgers (1977) postulated a similar net inshore-offshore movement for many of demersal shelf fishes.

Most of the northern Gulf fishes are temperate with incursions of Caribbean faunas, and exhibit seasonal distribution and abundance fluctuations, which are probably largely related to oceanographic conditions.

Studies by Bright & Cashman (1974), Causey (1969), Walls (1973) have been conducted concerning the fish fauna of offshore banks (hard substrates) of the northern Gulf of Mexico, another study has been directed towards studying the fish fauna of offshore oil platforms. Sonnier, et al. (1976) made observations, photographs and collections of fishes on the western reefs of the outer Louisiana continental shelf and around oil platforms and verified the presence of an extensive tropical fish fauna. Of 105 species recorded, about 50 percent were tropical species either unreported or rarely reported from the northwestern Gulf of Mexico. More species were found around reefs than oil platforms, although a number were common to both.

Sonnier, et al. (1976) also found that platforms generally show a lesser growth of epifauna than the reefs, suggesting fewer niches. This estimate of 49 species occurring on platforms and 93 species on the reefs also reflects that the platforms studied were inshore of the deeper reefs and subject to greater water temperature fluctuations.

4. Benthos

The benthos are those organisms which are largely restricted to the seafloor and include sessile, attached, creeping and burrowing forms.

The Benthic communities of the OCS are distributed largely by sediment type and depth of water. Factors which also control the occurrence of benthic organisms are salinity, temperature, currents, food availability etc. Defenbaugh (1976) has delineated 12 different benthic zones from his studies of the continental shelf off Pensacola, Florida to Brownsville, Texas (fig. 29).

The benthos has both floral and faunal components, the floras representatives being algae and seagrasses. The abundance of benthic algae is limited by the scarcity of suitable rocky substrates and light penetration in the Western Gulf of Mexico. Bright, et al. (1976) have recorded algae from submarine banks off Louisiana and Texas. In exceptionally clear waters, benthic algae are known to grow in at least 183 m of water, especially coralline red algae, and apparently green brown, and non-coralling red algae as well (Humm, 1973). Representatives of the four major phyla of algae (*cyanophyta*, blue-green; *Rhodophyta*, red; *Phaeophyta*, brown; *Chlorophyta*, green) may be found in suitable locations, but in offshore waters, red and brown algae predominate (Odum, 1971).

Offshore seagrasses are not conspicuous in the Western Gulf. Humm (1973) states that seagrasses would be continuous around the entire periphery of the Gulf if it were not for the adverse effects of low salinity and turbidity of the Mississippi River effluent from the delta to Galveston. In deeper offshore waters some of the seagrasses may be continuous.

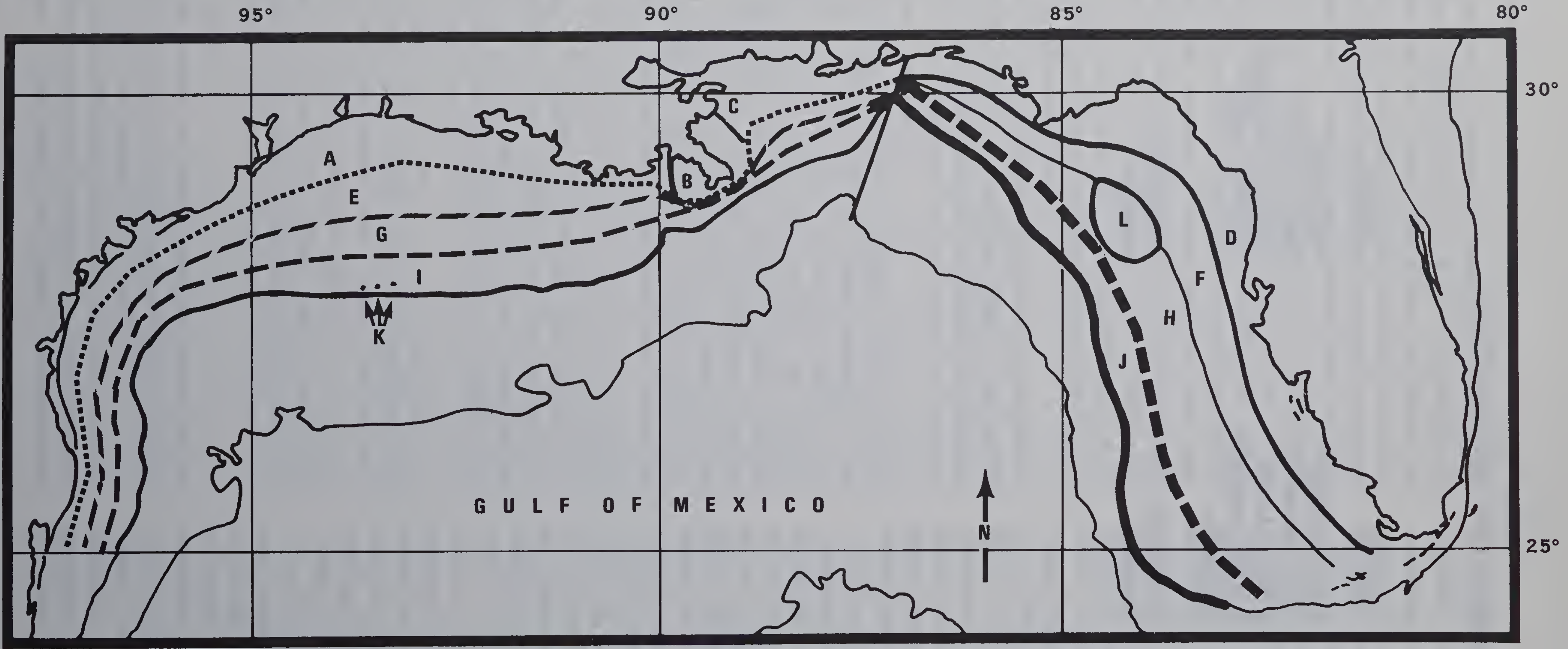
The benthic faunal representatives offshore include almost all animal phyla. The benthic faunal is composed of infauna, those animals that live in the substrate like burrowing worms and molluscs, and epifauna, those animals that live on the substrate like molluscs, crustaceans, hydroids, sponges, anemones, corals, etc. The commercial shrimps, *Penaeus* spp., and demersal fishes are closely associated with benthic communities. The demersal fishes include such commercial important species as flounders, snappers, groupers, and croakers.

The trophic interactions of the continental shelf have not been extensively studied. Rodgers (1977) described the trophic interrelationships of demersal fishes in the northern Gulf of Mexico and postulated two food chains for the shelf benthos. First, a planktonic chain involving conversion of energy fixed by phytoplankton to zooplankton for utilization by higher consumers; and benthic chain involving conversion of energy fixed in organic detritus to detritus feeders for utilization by con-

Table 9-A
Representative Nektonic Fishes

	Coastal	Oceanic
Pelagic	King mackerel	Billfish
	Chub mackerel	Mako sharks
	Butterfishes	Frigate mackerel
	Scaled sardine	Bluefin tuna
	Menhaden	
Demersal	Flounders	Snappers
	Croaker	Grouper

FIGURE 29
FAUNAL ASSEMBLAGE



SOURCE: (DEFENBAUGH, 1976)

NOTES:
A. Inner shelf (Texas-Louisiana).
B. Pro-delta fan.
C. Pro-delta sound.
D. Inner shelf (West Florida).
E. Intermediate shelf (Texas-Louisiana).
F. Intermediate shelf (West Florida).
G. Outer shelf (Texas-Louisiana).
H. Outer shelf (West Florida).
I. Upper slope (Texas-Louisiana).
J. Upper slope (West Florida).
K. Submarine banks (Texas-Louisiana).
L. Florida Middle Ground.

sumers in the sediment and eventually consumers in the water column.

An extensive nepheloid layer extends over the bottom waters through much of the northwestern Gulf. This eliminates most of the clear water, turbidity intolerant species of biota. There are many features of high relief which rise off the Gulf floor, above the nepheloid and support clear water benthic assemblages and associated nekton. The Flower Garden reefs are the most notable of these; they are coral reefs and support a diverse tropical fauna.

5. Birds

The beaches and coastal marshes of this central Gulf of Mexico region are inhabited by migrant and non-migrant bird species such as: plovers, sandpipers, curlews, loons, coots, gulls, herons, ibis, and egrets.

Pelagic birds (jaegers, gannets, shearwaters, boobies, frigates, terns, petrels, and noddies) all occur in the Gulf of Mexico region (Murphy, 1967). However, the majority of these species are rarely observed from land and their numbers are unknown.

Seabird rookeries of the least, sandwich, royal, caspian and Forster's terns are found along the Louisiana (Breton, Chandeleur, and Tern Islands) and Mississippi (Cat, Ship, Horn and Petit Bois Islands) Gulf coast areas.

Colonial nesting and wading bird colonies (herons, egret, and spoonbill) are dispersed throughout the Gulf of Mexico coastal region.

Several species of waterfowl (mainly gadwall, teal, pintail, mallard, and widgeon) utilize the Central and Mississippi Flyways as they migrate into the western and central Gulf of Mexico coastal areas. Migrant waterfowl over-winter in these areas; their numbers start increasing in early October and increase steadily reaching a peak in December. An estimate of the over-wintering population for this region ranges from four to six million ducks and geese.

6. Marine Mammals

The marine mammal fauna of the central and western Gulf of Mexico consists of cetaceans (whales and dolphins).

Schmidly and Melcher (1974) have documented 16 species of cetaceans near the Texas coast.

Bottlenose and Atlantic spotted dolphins are the most common small cetaceans, whereas short finned pilot and sperm whales are possibly the most common larger cetaceans found in this region (Schmidly and Shane, 1976). Therefore, these four species of cetaceans have been selected as representative species for further discussion.

The bottlenose dolphin is the most common species found in the inshore waters of this region. Available data suggested there may be small, discrete ("resident") populations in this region. For the Alabama, Mississippi, and eastern Louisiana coastal waters, a summer population estimate for this species ranges from 1,749 to 7,623 (Leatherwood and Platter, 1975). For the Texas coastal area the population estimate ranges from 1,000 to 5,000 bottlenose dolphin (Orr, 1977).

The Atlantic spotted dolphin is probably the most common species found offshore in this region. During the late spring it sometimes moves inshore. Population estimates have not been determined for this species in this region.

The short finned pilot and sperm whales probably occur year-around in this region, mostly in deep offshore waters. Population estimates have not been determined for these species in this region (FR 42:147, 8/1/77).

7. Marine Turtles

Four species of marine turtles occur in the Gulf of Mexico: loggerhead, green, Kemp's Ridley, and leatherback. All of these species are designated as "endangered" by the Convention on International Trade in Endangered Species of Wild Fauna and Flora. The loggerhead and green marine turtles are listed as "threatened" and the Kemp's Ridley and leatherback are listed as "endangered" under the Endangered Species Act of 1973.

Loggerhead turtles nest on beaches of the Northern Gulf during summer months. Ogren (1977) observed this species in nesting activity on Errol and Chandeleur Islands in the early 1960's although very little loggerhead nesting has been reported from there since those years. Other offshore islands east of the Mississippi Delta may host a few nesting turtles. No nesting activity was observed west of the delta on aerial surveys conducted during the peak of the 1977 reproductive season.

St. George Island in Florida was the principle nesting area for loggerheads in the northern Gulf of Mexico in 1977.

It has been reported that subadult green turtles have been captured by trot line fishermen in Laguna Madre, Texas.

The Kemp's Ridley is truly an endangered species. The number of nesting females has declined from over 40,000 in the 1940's to about 400-500 in 1976. Although Ridleys nest in abundance only in Tamaulipas, Mexico, it is apparent that the Northern Gulf of Mexico coastal area (i.e. the shrimping grounds) is a primary forage area for this species which can be considered a ''Gulf of Mexico'' sea turtle.

The Kemp's Ridley and leatherback turtles have been recorded as nesting on Padre Island, Texas (Hildebrand, 1963). Hildebrand (personal communication) stated that the major feeding grounds for the Kemp's Ridley may be off Louisiana. Dobie et al. (1961) reported on the food habits of this species and confirmed Hildebrand's statement that portunid crabs made up a large portion of the diet of those specimens examined. Pritchard and Marquez (1973) reported captures of Kemp's Ridleys off Texas and Louisiana which were tagged at the Rancho Nuevo in Tamaulipas, Mexico.

Although a tropical nesting species, the leatherback ranges widely throughout the Gulf of Mexico. Very few leatherbacks nestings in the Gulf have been confirmed. Many observations have been made of large numbers of leatherbacks feeding on jellyfish in inshore waters during the summer (Ogren, personal communication).

8. Other Wildlife

Other wildlife species inhabit the central and western Gulf of Mexico region. The following discussion will be limited to a few representative species which inhabit the coastal counties located within the region of this proposal.

A unique population of white-tailed deer (*Odocoileus virginianus mcilhennyi*) exists in the delta marshes at the mouth of the Mississippi River. The population (150 to 200) fluctuates with the changing conditions of the delta habitat.

Nutria (*Myocaster coypus*), muskrat (*Ondatra zibethicus*), and raccoon (*Procyon lotor*) are important furbearers which inhabit the coastal marshes of the central Gulf. Pelts and meat from these animals produced an income over 13 million dollars during 1975-76 in Louisiana. (La. Dept. of Wildlife and Fisheries, 1977).

9. Threatened and Endangered Species

The Fish and Wildlife Service (FWS) has designated a critical habitat for several endangered species. The notice pertaining to critical habitat designation (Federal Register, 1975) states that ''critical habitat'' for any endangered species could be the entire habitat or any portion thereof, if, and only if, any constituent element is necessary to the normal needs or survival of that species. The following vital needs are relevant in determining ''critical habitat'' for a given species: (1) Space for normal growth, movements, or territorial behavior; (2) Nutritional requirements, such as food, water, and minerals; (3) Sites for breeding, reproduction, or rearing of offspring; (4) Cover or shelter; or (5) Other biological, physical, or behavioral requirements.

Pursuant to Section seven of the Endangered Species Act of 1973 all Federal agencies must take such action as is necessary to insure that actions authorized, funded, or carried out by them do not result in the destruction or modification of this critical habitat area.

The Bureau of Land Management maintains frequent contact with FWS and National Marine Fisheries Service (NMFS) in meeting its responsibilities under Section seven of the Endangered Species Act and the Marine Mammals Act. Resource reports are requested from FWS and NMFS in the preparation and review of each environmental statement.

Several federally designated endangered species occur, either on a permanent or transitional basis, within the region being assessed for this proposal.

The sei, fin, blue, black right, and sperm whales are endangered cetaceans species which occur in the central and western Gulf of Mexico (Waring, 1976). These species were classified as endangered on December 2, 1970. The population status and migration patterns of these species in the Gulf is unknown.

The Florida manatee was listed as endangered in the Federal Register on March 11, 1967. Its present range is mainly peninsular Florida with occasional sightings along both the Gulf and U.S. South Atlantic coasts. Critical habitat for this species was determined and published in the F.R. on September 24, 1976. Current population estimates range from 750 to 900 individuals.

The red wolf was listed as endangered on October 13, 1970. Today, the only genetically pure population not in captivity may be found along the Gulf coast in Chambers and Jefferson counties, Texas, and Cameron and Vermilion parishes, Louisiana.

The Mississippi sandhill crane is presently restricted to a relatively small area in southern Jackson County, Mississippi. The species was classified as endangered on June 4, 1973 and its critical habitat has been determined and identified in the August 8, 1977, Federal Register. Present population estimates range from 30 to 50 individuals.

The whooping crane was listed as endangered on March 11, 1967. Its wild breeding population nests in Woods Buffalo National Park, Northwest Territories, Canada, and winters from October to April on and adjacent to the Aransas National Wildlife Refuge in the Texas gulf coastal area. On May 15, 1978, a critical habitat was established for the whooping crane in Aransas, Calhoun and Refugio Counties, Texas. The Texas population as of December 1977 numbered 70 birds.

The bald eagle was initially considered to have two distinct subspecies when the southern bald eagle was originally listed as an endangered species on March 11, 1967. The entire species was listed as endangered in 43 of the conterminous 48 states and threatened in the remaining five states on February 14, 1978. The bald eagle populations occurring within the area which may be impacted by the proposed sale are listed as endangered. The only known active nest in Mississippi is in Harrison County. There were 14 reported active nests in Louisiana during the 1978 nesting season, located primarily in the coastal Jefferson, Plaquemines, St. Charles and Terrebonne parishes. Eight breeding pairs are located in Goliad, Refugio, Calhoun, Victoria, Matagorda, Brazoria, Orange, and Trinity Counties in Texas.

The Arctic peregrine falcon listed as an endangered species on October 13, 1970. The bird is a medium sized falcon which is listed as endangered in Canada, the United States, and Mexico. Critical habitat has not yet been determined for this subspecies.

The brown pelican was listed originally as endangered on October 13, 1970. The bird normally ranges on the eastern seaboard from North Carolina to Florida and around the Gulf coast of Texas and Mexico. Within the U.S. a small population of about 50 individuals exists in Texas and is increasing slowly. Louisiana populations are those restocked from Florida since 1968, plus offspring from those birds since 1971. Critical habitat has not been determined for this species.

Attwater's prairie chicken was listed as an endangered species on March 11, 1967. Approximately 2,000 individuals of this species remain in local colonies on the mid-Texas coast.

The American alligator was listed originally as endangered on March 11, 1967, and subsequently was reclassified as threatened in Cameron, Vermilion and Calcasieu Parishes in Louisiana on September 26, 1975. It was reclassified as threatened in the wild in Florida and the Gulf Coast States and inland to Oklahoma and Arkansas. Critical habitat has not been determined for this species.

The loggerhead and green sea turtles were listed as threatened on August 26, 1978. Both species are found in the Gulf of Mexico. Critical habitat has not been determined for these species. St. George Island in Florida was the principle nesting area for loggerheads in the northern Gulf of Mexico in 1977.

The Kemp's Ridley sea turtle adults are found only in the Gulf of Mexico. Immature Ridleys occur along the coast as far north as Massachusetts. Critical habitat has not been determined for this species. The Kemp's Ridley is believed to nest on Padre Island and on the beaches of Kleberg, Kenedy, Willacy and Cameron Counties on the Texas gulf coast.

The hawksbill turtle was listed as endangered on June 2, 1970. The distribution of the hawksbill in the Atlantic Ocean extends from southern Brazil to Massachusetts. Nesting occurs on scattered islands and shores generally between 25 degrees latitude north and south. In the conterminous United States nesting is limited to infrequent Florida nestings.

The leatherback turtle was originally listed as endangered on December 2, 1970. The distribution of the leatherback is worldwide. On the gulf coast, sightings are common in March and April. Two reported nesting occurrences in Florida have been on public-owned beaches: Sebastian State Park and St. Vincent's National Wildlife Refuge.

10. Biologically Sensitive Areas

Biologically sensitive reefal features adjacent to or contained in certain lease blocks for this proposed sale will be treated in the narrative below. Discussion on other reefal features may be found in preceding sections. Proposed stipulations to protect these biologically sensitive features are discussed in section IV.D.7.

The East Flower Garden Bank, west of tract 58A-115, is unique in that it and West Flower Garden Bank are the only examples of extensive tropical Caribbean coral reef communities found in the northern Gulf. The following description of East Flower Garden Bank is taken from Bright, 1977 (fig. 30).

Over 250 species of benthic invertebrates and more than 100 fishes inhabit the bank. Above 25-29 m the bank is covered with a thriving submerged coral reef which, except for its total lack of shallow-water alcyonarians, is a good example of the *Diploria-Monastrea-Porites* community so common on reefs in the Caribbean and Southern Gulf.

In addition, the bank harbours sizeable knolls occupied almost entirely by populations of the small branching coral *Madracis mirabilis* (*Madracis* Zone). Finger-sized remains of dead *Madracis* are extremely important components of the sediment on and adjacent to the reef. In some cases the coarse carbonate sand which tupically occurs between coral heads in the *Diploria-Monastrea-Porites* Zone is entirely supplanted by *Madracis* rubble.

Other knolls at the bank are covered completely by lush growths of leafy algae (*Caulerpa*, *Chrysymenia*, *Halymenia*, *Lobophora*, *Microdictyon*, and others). The presence at the East Flower Garden of this Leafy Algae Zone, the *Madracis* Zone, and knolls of intermediate biotic composition (which bear various types of sponges, *Madracis* clumps, patches of leafy algae, and extensive encrustations of coralline algae) is indicative of a greater degree of lateral biotic variability on the 69 ac crest of this bank than has been observed at the West Flower Garden Bank.

Between 50 and 76 m, the bank is occupied by an Algal-Sponge Zone. The bottom in the Algal-Sponge Zone is covered primarily with nodules (up to fist size and larger) composed of encrustations of coralline algae, mostly *Lithophyllum* and *Lithothamnium*, with lesser amounts of the encrusting foraminifer *Gypsina plana*. The coralline algae are important and abundant in the *Diploria-Monastrea-Porites* Zone, as well as the Algal-Sponge Zone, extends to depths exceeding 90 m decreasing in percent cover below 75 m or so.

In the lower reaches of the Algal-Sponge Zone the nodules give way to coralline algal crusts adhering to the hard carbonate substratum. Among and attached to the nodules of the Algal-Sponge Zone is a sizeable population of leafy algae, generally the same organisms which occur in the Leafy Algae Zone at the bank. Sponges are very conspicuous, particularly the encrusting *Neofibularia nolitangere oxeata*, the tube sponge *Callyspongia vaginalis* and a branching sponge, *Verongia* sp. Other notably conspicuous invertebrates of this zone are small saucershaped growths of agariciid stony corals and a large anemone, *Condylactis* sp.

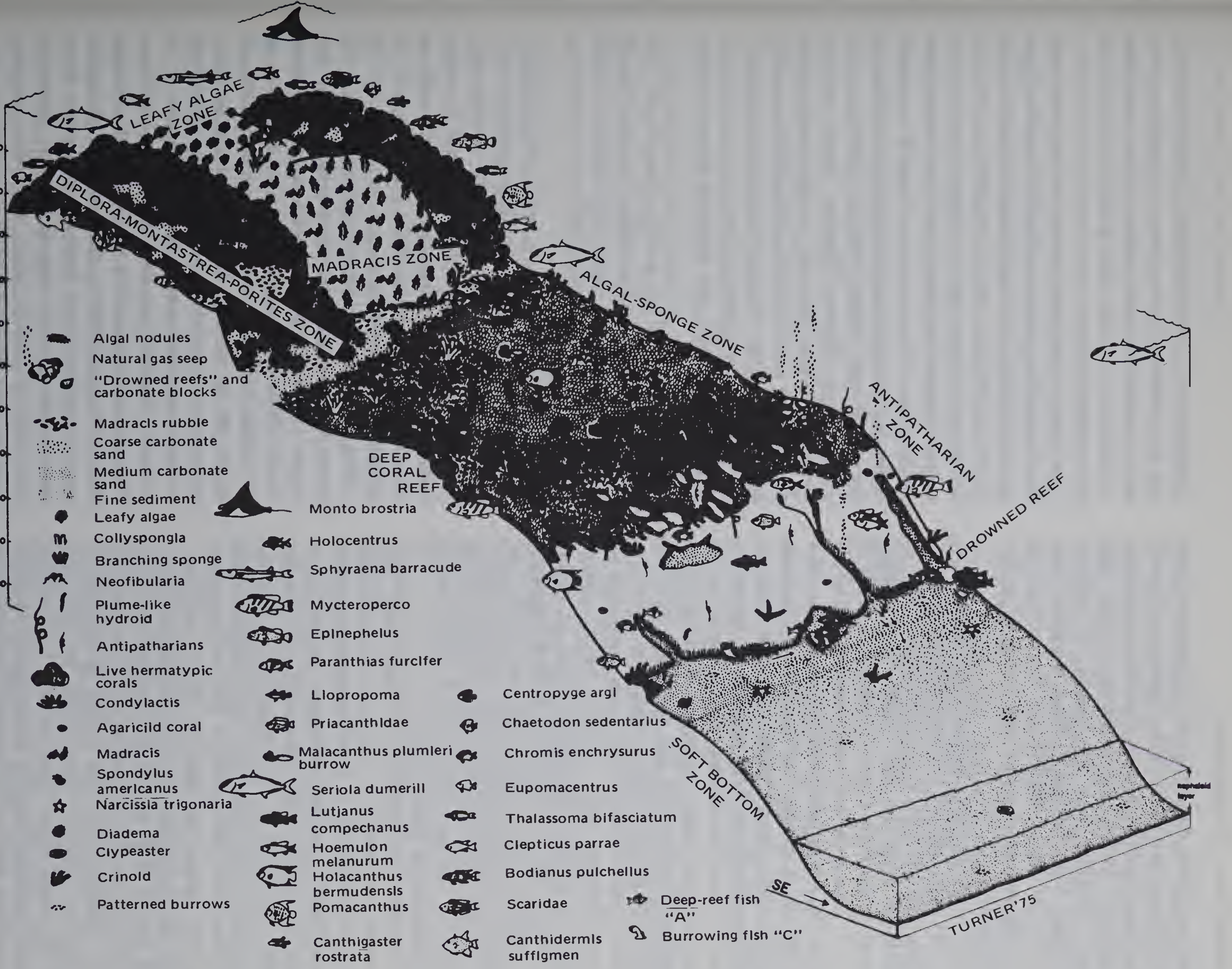
Certain expatriate reef fishes are moderately abundant within the Algal-Sponge Zone (viz: squirrelfishes, *Holocentrus* spp.; groupers, *Mycteroperca* spp.; Creolefish, *Paranthias furcifer*; Wrasse bass, *Lioproma eukrines*; Red snapper, *Lutjanus campechanus*; Verminion snapper, *Rhomoboplites aurorubens*; Reef butterflyfish, *Chaetondon sedentarius*; Blue angelfish, *Holacanthus bermudensis*; Cherubfish, *Centropyge argi*; Yellowtail reeffish, *Chromis enchrysurus*; and Spotfin hogfish, *Bodianus pulchellus*).

The deepest hard-bank assemblage represented at the East Flower Garden Bank is the Antipatharian Zone. The Antipatharian Zone represents a transition downward from the shallow-water benthic biota to a truly deep-water assemblage. Missing from the Antipatharian Zone proper are any stony corals except sparse populations of the saucer-shaped agariciid, a small species of *Madracis* and some solitary ahermatypic varieties. *Lithophyllum* occurs in reduced quantities, and leafy algae are sparse. Present are abundant populations of comatulid crinoids, and deep-water alcyonarian fans and whips, all of which are either absent from or rare above 76 m at the Flower Gardens. The most conspicuous organism in this zone is a bedspring-shaped, white antiparharian sea whip, *Cirripathes*. Although the depth range of the antipatharians extends upward almost to the coral reef they are rarely seen shallower than 55 m.

Natural gas seeps have been observed at most of the major reefs and banks off Texas. These seeps are intermittent in nature and characteristically emit repeated short bursts of several to hundreds of bubbles, each generally less than one inch in diameter.

The chemical compositions of gases collected from various seeps suggest that some are of biogenic origin (microbial decomposition of organic matter in anoxic environments at temperatures below 50°C) and some are petrogenic (thermocatylitic processes acting on organic

FIGURE 30
EAST FLOWER GARDENS BANK



SOURCE: BRIGHT ET AL. 1976

NOTES: Based on observations made from the Texas A&M Oceanography Department research submersible DIAPHUS matter at higher temperatures). It is apparent that the gas seeps associated with shallow coral reefs at the East and West Flower Gardens are biogenic in nature, although deeper seeps at the East Flower Garden may be partly or wholly petrogenic. Whatever their origin, the gases from these seeps have been found to consist of 98.5-99.99 percent methane with traces of ethane and propane.

There is no evidence that such seeps have had any large scale effects on benthic populations. A possible instance of very localized effects of biogenic gas seeps on coral "health" was recently detected at the West Flower Garden at a depth of 25 m. A *Monastrea annularis* head around which gas was intermittently bubbling ranged in color from brown to mustard yellow and was plagued with ulcer-like dead patches covered with or ringed by growths of filamentous algae. However, insofar as such conditions are common at the Flower Garden Banks there may be little or no connection between the gas seep and the poor condition of the coral. Speculation that fishes are attacted to gas seeps has not been confirmed by our observations. The fish are nearly always inclined to position themselves over or beside coral heads, rocks, outcrops or bottom irregularities. Where they occur, the gas seeps are frequently associated with these features. However, fishes congregating nearby seem to be oblivious of the gas, showing no behavior which would indicate an affinity for it.

A quarter hectare or so brine pool was discovered in 1976 in a depression on the East Flower Garden Bank at 72 m. Apparently seeping from a diapiric structure underlying the bank (salt domes are common off Texas and Louisiana, accounting for many of the topographical features found there), the 188 parts per thousand (ppt) brine flows over the margin of the pool down the axis of a canyon cut into the bank's hard carbonate substratum and out onto surrounding level, sandy bottom at 80 m. By the time the brine has traveled this far it has become diluted to 39.6 ppt due to turbulent flow and mixing in the axis of the canyon. This is evidence that the sustained flow of dense water through the 7-15 m deep canyon contributes locally to sediment transport and erosional processes resulting in movement of sand-to-cobble-sized particles off the hard-bank and possibly disintegration and dissolution of the old reef, which seemingly at this depth is a coralline algal bioherm.

Filamentous and leafy algae are associated with the East Flower Garden brine. A significant bacterial population on the bottom of the brine pool is indicated by large vivid patches of purple on the sediment surface.

In spite of its rather potent nature, the brine does not appear to have affected epibenthic populations outside of a ring extending a meter or so above the interface between the brine and overlying average marine water. Fishes were not observed to enter the highly saline brine in the pool but groupers, *Mycteroperca*, spp., and Cottonwick, *Haemulon melanurum*, swam freely in and out of the mixing brine stream within the canyon.

The West Flower Garden Bank, to the southwest of tract 58A-118, is quite similar to the East Flower Garden Bank, although it apparently lacks some of the shallower biotic zones found at the East Flower Garden above 45 m, namely, the Leafy Algae Zone and *Madracis* Zone (see fig. 30).

Water clarity on the bank is exceptional, with visibility consistently exceeding 15 m and often 30 m. The main living coral reef (*Diploria-Porites* Zone) occupies the crest of the bank down to approximately 46 m depth.

Living corals cover 30 to 50% of the bottom where the reef is developed, and the major reef builders are *Montastrea*, *Diploria* and *Porites*, probably in that order of importance. The fire coral, *Millepora alcicornis*, encrusts reefrock throughout the zone as do various species of sponges and other epifauna.

The stipulations proposed in Section IV.D.7. for tracts 58A-115 and 58A-118 would prohibit any oil and gas activity on the banks, require shunting of all drilling fluids and cuttings to within 10 m of the botton in the area within three nmi (5.486 km) of the 85 m isobath, and require a monitoring study to be conducted on all drilling operations within 1 nmi (1.829 km) of the 85m isobath.

Bright Bank is about 4 km south of Tract 58A-37, and is thought to be quite similar biologically to the East Flower Garden Bank at similar depths (fig. 30). Bright Bank crests at about 50 m water depth, so it is unlikely that any extensive coral reef is present there, but other reef associated biota (tropical reef fishes, solitary corals, a lush and extensive leafy algal-sponge zone) which are considered unique for this part of the Gulf are present (Bright *et al.*, 1976). The stipulation would require either shunting of all drilling fluids and cuttings to within 10 m of the bottom or a monitoring study to be conducted on all drilling operations within 3 nmi (5.486 km) of the 85 m isobath of Bright Bank.

Stetson Bank, west of Tract 58A-20, has about 35 m of relief rising out of a 65 m depth. This bank consists of siltstone outcrops inhabited by biota similar to that found at Bright Bank and East Flower Garden Bank; although it's less diverse and productive because of shallower water, less relief, and more turbid water conditions. Like Bright Bank, no coral reef is present, but reef associated organisms are found here. The stipulation that would protect these biota by requiring either shunting or monitoring on all operations within 3 nmi (5.486 km) of the 50 m isobath of Stetson Bank.

A small unnamed bank is located to the southeast of Tract 58A-89. This bank crests at about 70 m water depth, rising out of 120m, and is considered to be similar to Bright Bank and East Flower Garden Bank at corresponding depths. The stipulation (section IV.D.7.) would protect this bank in a manner similar to that for Bright Bank and Stetson Bank.

11. Saltmarsh

Saltmarshes exhibit distinct zonation the dominant plants. This zonation is controlled by a variety of factors including soil types, soil salinity, tide, elevation, drainage characteristics, and pH. The extent of saline intrusion into the marsh depends to a large degree on the rate of percolation (movement through soils) of saltwater at high tide, and the location of points of influx of freshwater from the mainland. On the Louisiana coast, the saline marsh is generally adjacent to the beach rim and may vary from 2 to 24 miles in width.

The comparatively small number of plant species of the saltmarsh limits the number of available niches in which organisms may live. Only 17 plant species have been recorded from the coastal saltmarsh of Louisiana, with saltmarsh cordgrass (*Spartina alterniflora*) being the dominant species (Chabreck, 1972). However, with the inland marsh succession, habitat complexity increases significantly.

Saltmarsh cordgrass (*Spartina alterniflora*) comprises the most seaward of the vegetation zones where it endures the deepest and longest inundation by salt water. Black rush (*Juncus roemerianus*) inhabits the next zone inland and therefore occurs on slightly higher ground. This species forms almost pure stands to heights of 1.8 to 2 m and functions to slow down tidal penetration. The third zone inland is dominated by salt grasses (*Distichlis spicata*) and wiregrass (*Spartina patens*). This zone is rarely inundated except during high tides.

Saltmarshes support considerable populations of rails, sparrows, ducks, numerous shorebirds and a few reptiles. The area also functions as a hatchery for fish and invertebrates which are essential to the maintenance of the higher vertebrates.

12. Brackish Marsh

Brackish marshes are usually situated between the seaward saltmarsh and landward intermediate and fresh water marshes. These brackish marshes are located extensively in southeastern Texas and the coast of Louisiana.

Salinities vary annually between an average low of 3.4 ppt (parts per thousand) to an average high of 16.7 ppt. Highest salinities occur in June, or in the drought period.

Plant species diversity increases as one approaches the upland environment from the marsh. Forty species of plants have been recorded in the brackish marsh. The dominant species wiregrass, comprises 55 percent of the total vegetation. Saltgrass, makes up 13 percent of the remaining 39 species. Only five other species have been recorded with coverage greater than two to five percent.

13. Intermediate Marsh

Intermediate marshes extend farther inland than brackish marshes. In the Gulf of Mexico coastal zone they are distributed predominantly in the southwestern region of Louisiana and southeastern Texas.

A more diverse vegetation occurs in the intermediate marsh than the brackish or saline marshes. Fifty-four species of plants or 35 percent more than in the brackish zone occur in the intermediate marshes. The dominant wiregrass makes up a third of the vegetation. Roseau (*Phragmites communis*), and bulltongue (*Sagittaria falcata*), comprise 6.6 percent and 6.5 percent of the vegetation, respectively.

14. Freshwater Marsh

Predominant freshwater marsh in the area is situated in the more central region of the Mississippi Delta near the distributary passes. Major species of vegetation in this marsh are: roseau cane, Eurasion water milfoil, alligator weed, duck weed, water hyacinth, dogtooth grass, bulltongue, and pondweed and maiden cane.

A substantial freshwater wetland system exists throughout the central Gulf Coast region. Freshwater marshes in coastal Louisiana exhibit greater species diversity while comprising approximately 34 percent of the wetlands in the coastal zone (Chabreck, 1972).

15. Seagrasses

Seagrasses consist of species of flowering plants that grow completely submerged (some are tidally emergent) in brackish to saline waters. They are limited to water where sunlight penetration permits photosynthesis, such as are found in the shallow waters of bays and around islands in areas of low turbidity.

Marine grass beds support one of the highest biomass densities in the marine environment. They not only provide a valuable food source for migratory waterfowl and shorebirds, but also provide prime nursery grounds for shrimp, crabs and fishes of all types. While few animals feed on the grasses, many feed on organisms which attach to or live on them; viz., snails and mussels.

Seagrass communities are fragile ecosystems which advance and decline readily in response to minor changes in water quality, turbidity, or sediment loads and are vulnerable to storm damage. The U.S. Fish and Wildlife Service (personal communication) reported that the largest of these marine meadow communities in Louisiana is located immediately west of the Chandeleur Islands from Whitehouse Point south to the area of Polo Island. Species include *Syringodium filiforme*, *Thalassia testudiunum*, *Halodule beaudetti*, *Halophila engelmanni* and *Ruppia maritima*. Extensive areas of the Laguna Madre in Texas are carpeted by *Halodule beaudetti* while *Ruppia maritima* is common in sheltered coves. *Thalassia testudinum* is limited to areas of the southern Laguna Madre in the Laguna; *Syringodium filiforme* is less common, but is increasing its range to the northward in the laguna. *Thalassia* and *Halodule* are common in estuaries of the central Texas coast, while *Ruppia* and *Halodule* are most common along the east Texas coast. Data are not available on other seagrass communities in this proposed sale area.

16. Estuaries and Embayments

Estuaries and bays are highly productive ecosystems. It is estimated that 97.5 percent of the total commercial fisheries catch of the Gulf States is made up of fresh and shellfish species that spend at least a portion of their life cycles in the estuaries (Gunter, 1967). They receive nutrients from upland areas via major river systems, especially during spring flooding. They also receive the nutrient wash-out from tidal flushing of the salt marsh, particularly during mid-winter when marsh grass of the previous season is decomposing. The dynamics of this system applies to the estuarine areas of Texas, Louisiana, Alabama, and Mississippi. A detailed description of the Alabama coastline is provided in Alabama Geological Survey (1974, 1975, 1976).

17. Beaches and Barrier Islands

Much of the Texas, Louisiana, Mississippi, and Alabama coastline is protected from the full force of oceanic waves by barrier islands. The seaward margins of these islands, which are exposed to waves formed at sea, are called high energy beaches. Organisms living in such areas are adapted to survive the scouring force of wave action by burrowing into the sand. The sand bug (*Emerita talpoida*), the butterfly shell, the variable wedge shell (*Donax variabilis*), and others can bury themselves almost instantaneously. This ability enables them to live directly in the surf zone (Collard and D'Asaro, 1973).

Several groups of barrier islands front the Gulf coastal states affected by this proposed sale. Many offer environments distinct from the other island groups. Major barrier islands for the western and central Gulf are:

1. Brazos Island - Texas
2. Padre Island - Texas
3. Mustang Island - Texas
4. San Jose Island - Texas
5. Matagorda Island - Texas
6. Matagorda Peninsula - Texas
7. Galveston Island - Texas
8. Isles Dernieres - Louisiana
9. Timbalier Islands - Louisiana
10. Grand Isle - Louisiana
11. Grand Terre Islands - Louisiana
12. Chandeleur Islands - Louisiana
13. Cat Island - Mississippi
14. Ship Island - Mississippi
15. Horn Island - Mississippi
16. Petit Bois Island - Mississippi

17. Dauphin Island - Alabama

C. Socioeconomic Environment

1. Human Utilization

A. LAND USE

Coastal land use information for the states adjacent to the proposed sale area is variable in age, detail, and scale of treatment. Current land uses in the coastal areas of the states adjacent to the proposed sale include virtually all possible mixes (Visual No. 6). Predominant land uses are urban uses, agricultural uses, and swamp and marsh wetlands. Coastal areas are highly urbanized; large urban concentrations are evident in the areas of Houston, Galveston, Beaumont, Port Arthur, New Orleans, Morgan City, virtually the entire Mississippi Gulf Coast, and Mobile.

Agriculture, particularly rice and sugar cane farming and cattle production, is an important use in the western Gulf coastal zone. Wetlands, including marshes and swamps are extensive in the coastal zone, especially in Louisiana. Marsh wetlands, besides providing important fish and wildlife habitat and acting as a buffer to storm generated tides, also provide important opportunities for mariculture and recreation. Swamp, wetlands and forest areas represent important uses and function as wildlife habitat, recreational areas, and as timber resources utilized by pulpwood and lumber industries.

Public and semi-public uses, including public beaches, parks, game refuges and wildlife management areas, and public facilities such as hospitals, libraries, airports, schools and government owned and operated service facilities, while concentrated in urbanized areas, are scattered throughout the coastal zone.

The coastal zone contains a broad variety of land uses ranging from highly urbanized areas to sparsely populated uplands and inaccessible swamps and marshes.

B. OCEAN DUMPING, DREDGING AND SOLID WASTE

(1) Ocean Dumping

Ocean dumping under the 1972 Marine Protection Research and Sanctuaries Act is regulated by the U.S. Environmental Protection Agency.

In the Federal Register of January 11, 1977 (Vol. 42, No. 7, pages 2462–2490), EPA published the "Final Revision of Regulations and Criteria for Ocean Dumping". All ocean dumping must have a permit EPA listed two "Approved interim dumping sites" in the Gulf of Mexico at the following locations: 27°12′N to 27°28′N and 94°28′W to 94°44′W, and 28°00′N to 28°10′N and 89°15′W to 89°30′W. In addition, an "Approved Ocean Dumping Site" was designated for the incineration of organochlorine wastes. This site is located at 27°06′12″N, 93°24′15″W; 26°32′24″N, 93°15′30″W; 26°19′00″N, 93°56′00″W; and 26°52′40″N, 94°04′40″W (Visual No. 5).

(2) Dredging

The marine transport of huge tonnages of materials has led to the development of ports and navigable waterways that could accommodate deep draft vessels. The development and maintenance of these ports and waterways requires extensive dredging of large volumes of sediments each year. The principal responsibility for dredging operations is vested with the U.S. Army, Corps of Engineers. EPA, however, having responsibility for water quality, has designated a number of "Dredged Material Sites", the locations of which are contained in the above mentioned Federal Register. These are all inshore in the vicinity of the Intracoastal Waterway or dredged channels and harbors. None of the tracts of this proposed sale are near these sites, and there will be no mutual interference.

Each year dredging operations are carried out in major harbors and along the Intercoastal Waterways. The disposal of the dredged material varies from open ocean dumping sites, diked areas near shore and onshore dumping sites. Following is a brief summary of some of the major dredging operations that occur along the Gulf coast.

TEXAS

There are two types of dredging operations along the Texas coast, hopper dredging which occurs in open water and at the entrance to bays, and pipeline dredging which occurs close to shore and in the intercoastal waterway. There are seven entrances to channels that are dredged, Brazos (240,000 cubic yards/year), Port Mansfield (130,000 cy/yr), Corpus Christi (400,000 cy/yr), Matagorda (800,000 cy/yr), Freeport (1,000,000 cy/yr), Galveston (3,230,000 cy/yr), and Sabine-Neches (3,000,000 cy/yr). The estimated total amount of maintenance dredging that occurs in these areas is 8.8 million cy/yr with new dredging accounting for 3.4 million cubic yards. The dredged material from these operations are disposed by ocean dumping, in open water areas in the bays, and on upland sites, many of which were wetlands prior to their use for this purpose.

The pipeline dredging operations occur along the intercoastal waterways and close to shore from Brownsville to the Texas-Louisiana border.

LOUISIANA

Thirty-eight percent of all U.S. dredging operations in the U.S. are handled by the New Orleans Corps of Engineers district office. Ninety percent of these operations are contracted and done by cutter head dredges. The Corps owns a hopper dredge which works mostly in Southwest Pass, Mississippi River-Gulf Outlet gulf approach channel, and the gulf approach channel to the Calcasieu River. All of the operations dispose of the dredged material in open water.

There are five major dredging operations, these are located in the delta area. A Southwest Pass operation from the head-of-pass to the Gulf of Mexico, about 32 km (20 miles) dredges a navigation channel on a yearly basis. There is approximately 7.2 million cubic yards/year of material dredged from this area and disposed of along the channel in the east and west bay areas. This operation is handled by two cutter head dredges.

The Atchafalaya Bar Channel is also dredged annually by two cutter head dredges. Approximately 10 million cubic yards/year of material are dredged and disposed of in open waters.

There is one hopper dredge in operation which is owned by the Corps of Engineers. This dredge operates in various locales during different times of the year. One area in which it operates is a Gulf entrance channel in Breton Sound nine miles out into the Gulf. This is a major deep draft shipping channel from which 6.6 million cubic yards/year of material is dredged. This dredged material is disposed of by ocean dumping. This dredge also operates around the mouth of the Calcasieu River where it dredges approximately 12 million cubic yards/year and in the jetty channel beyond 32 km (20 miles) of Southwest Pass where it dredges approximately 15 million cubic yards/year. The dredged material from both these sites are disposed of in the open water.

MISSISSIPPI AND ALABAMA

The U.S. Army Corps of Engineers, Mobile District has jurisdiction over both Alabama and Mississippi. There are two types of dredging operations along the coast, pipeline and hopper dredging. There are three areas that are maintained with a hopper dredge, Gulfport, Pascagoula and Mobile. This material is disposed of in ocean dumping sites.

Pipeline dredging is also used to maintain ship channels as in Mobile Bay area. The dredged material from this operation is mostly sandy silt and clay that is high in organic material. This material is disposed of alongside the operation into the open water. The major problems arising from this operation is mainly turbidity plume and the mud flow at the bottom.

(3) *Solid Waste*

Solid waste management is considered a state and local problem. The Federal government has no jurisdiction over disposal practices at other than Federal installations. It does provide grants for research and the development of new method of collection and disposal and purchases recycled materials. It has, in the past, funded demonstration projects for new technologies and has tried to eliminate discriminatory interstate transportation rates.

Most states require regional or county management plans specifying conditions and future alternatives. Regions and counties are urged to cooperate so as to share the financial burden and maximize the use and efficiency of disposal facilities. The problems are most acute in population centers where density is high, waste volumes are large, and disposal sites are scarce.

Estimates of the amount of solid waste generated per person range from 3.3 lb/day to 6 lb/day (Snyder, 1974; CEQ, 1974). The 3.3 lb/day figure includes wastes generated in households, commercial and business establishments and institutions. Higher figures include those generated by industrial processes, agricultural, construction, demolition and sewage wastes.

More than 90 percent of the solid wastes are directly disposed of on land, in open and burning dumps, or sanitary landfills. Other methods of disposal are incineration, use of materials to build such things as artificial reefs and collection and recovery. Sanitary landfilling, the preferred method involves the disposal of solid waste on land by spreading them in thin layers, compacting them to the smallest practical volume, and covering with soil. This method is employed by a majority of communities.

The Resource Conservation and Recovery Act of 1976 (P.L. 94-580), should help alleviate solid waste disposal problems. The stated objectives of this Act are to promote the protection of health and the environment and to conserve valuable material and energy resources. The Act intends that these objectives be achieved by:

Providing technical and financial assistance to state and local governments for development and implementation of solid waste management plans.

Providing training grants in solid waste occupations.

Prohibiting future open dumping on land and requiring upgrading or closing of existing open dumps.

Regulating the treatment, storage, transportation and disposal of hazardous wastes.

Promulgation of guidelines for solid waste management practices and systems.

Conducting a research and development program for improved solid waste management and resource conservation techniques.

Demonstration of improved solid waste management of resources conservation and recovery systems.

Establishing a cooperative effort among federal, state and local governments and private enterprises.

c. RECREATION

The northern Gulf of Mexico coastal zone is one of the major recreational areas of the U.S. particularly in connection with saltwater-fishing and beach-oriented activities.

The shorefront along the coasts of Texas, Louisiana, Mississippi and Alabama displays a diversity of natural landscapes. Barrier islands, coastal beaches, bays, sounds, river deltas and marshes and a subtropical climate provide an ideal setting for outdoor recreation. Visual Nos. 1 and 4 depict the major state and nationally recognized public interest areas. Included are publicly owned areas like parks, beaches and wildlife lands as wells as specially designated sites such as historic sites, natural landmarks and scenic rivers. Commercial and private recreational facilities and establishments such as resorts, marinas, and ornamental gardens also serve as primary interest areas and support services for people who seek enjoyment of the recreation resources influenced by the Gulf of Mexico. A general discussion of the different categories of areas found along the Gulf Coast which provide recreation opportunities are included in the following descriptions followed by a discussion of the major recreation activities taking place in coastal waters and nearshore areas of the central and western Gulf of Mexico.

(1) *Coastal Recreation Resources*

The areas described below include the traditional resources perceived by the general public as recreation destination areas (Visual Nos. 1 and 4).

NATIONAL PARKS

The National Park Service administers three areas within the planning region for this proposal. Areas in the National Park System were set aside by the National Congress specifically to preserve recreational, natural, and cultural resources of national significance and to systematically devise management schemes which will maximize public appreciation without endangering the resources. Two national seashores, Padre Island and Gulf Island National Seashore, focus recreation use along approximately 100 miles of beachfront facing the western and central Gulf. Over three million people visited these two seashores in 1976. Oil and gas activities are ongoing within Padre Island National Seashore. Horn and Petit Bois Islands, part of the Mississippi unit of the Gulf Island National Seashore, are likely to be designated National Wilderness areas.

NATIONAL WILDLIFE REFUGES

Ten national wildlife refuges are located along the coast of the western and central Gulf (Visual 4). Most tend to be oriented towards the management of waterfowl, endangered species, and other wetland wildlife; however, all encourage public visitation and accommodate those recreational activities that are compatible with the primary wildlife mission of the refuge. Some of the refuges, like Sabine, allow waterfowl hunting. Most refuges facilitate public fishing and all refuges encourage nature study, photography and wildlife appreciation. Most of Breton Refuge and a small section of Lacassine National Wildlife Refuge are included in the National Wilderness System. The Fish and Wildlife Service has plans to expand refuge holdings in the Gulf of Mexico coastal region. Aransas, Sabine, Lacassine and Delta-Breton National Wildlife Refuges accommodate oil and gas exploration and development within refuge boundaries.

STATE PARKS

Thirty-five state parks are existing or are under development along the Gulf Coast. These recreational areas vary in size and function, from multiactivity recreational areas like Galveston Island State Park to sites such as Ft. Pike in Louisiana developed around a historical theme. Many of the existing and developing state parks along the shoreline focus primary attention on their Gulf shorefronts.

STATE WILDLIFE REFUGES AND MANAGEMENT AREAS

Although management goals may differ somewhat from state to state these areas serve primarily to maintain habitat and breeding space for wildlife, and to provide wildlife oriented recreation under closely controlled conditions. There are 18 such areas in the coastal area of the western and central Gulf with most of them located in Louisiana's extensive marshlands. National Audubon Wildlife Sanctuaries which are under private control encourage nonconsumptive nature appreciation. One Audubon area, the Rainey Wildlife Sanctuary and several state management and refuge areas in the Louisiana marshlands, have ongoing oil and gas development.

LOCAL OUTDOOR RECREATION AREAS AND FACILITIES

In addition to Federal and State recreation areas, there are numerous City and County park and recreation areas in the coastal zone. These facilities are generally found in and around the major population centers where the demand for gulf front recreation areas is greatest. In addition, numerous private and commercial recreational facilities exist along the eastern Gulf coast. In Louisiana, for example, over 10,000 second homes or camps have been inventoried in the coastal marsh lands (Gary and Davis, 1977). The list could include resorts, marinas, tennis clubs, amusement and theme parks, water access sites, and many others. Although too numerous and diverse to map on the visuals, State road maps, travel brochures and literature disbursed by Chambers of Commerce list most of the commercial public interest areas.

SPECIALLY DESIGNATED AREAS

Also appearing on Visual 4 are areas specially recognized for their pristine natural qualities or cultural associations such as national natural landmarks, sites on the National Register of Historic Places, national wilderness areas, and scenic waterways. Although these areas may have been designated to preserve their special natural and cultural qualities for educational, aesthetic, and scientific purposes they can also accommodate a selected range of recreational activities.

The Marine and Estuarine Sanctuary Programs administered by NOAA were established in 1972 to recognize, protect and encourage understanding and enjoyment of unique, marine-related habitats and resources. Although NOAA has yet to designate a sanctuary in the Central or Western Gulf two nominated areas off the Texas coast have generated some support and are currently being evaluated by NOAA for Marine Sanctuary status. The two areas are the Flower Garden Banks near the shelfbreak and the Buccaneer Oil Field approximately 30 miles south of Galveston. Interest in the designation of both marine and estuarine sanctuaries is increasing; therefore, special marine areas in the central and western Gulf will likely be provided a special status in time. Other areas identified for sanctuary evaluation within the planning area include eleven of the South Texas fishing banks (Visual No. 4) and the following Texas coastal bay areas: Harbor Island-Redfish Bay; Espiritu Santo Bay; and Carlos, Mesquite and Ayres Bays.

BEACHES AND BARRIER ISLANDS

Wherever they are accessible for recreational use the sandy beaches and barrier islands along the edge of the central and western Gulf are of major recreational importance. Barrier islands and beaches extend almost continuously along Texas, Mississippi and Alabama shorefronts (Visual Nos. 1 and 4 and Table 10). Except for Grand Isle and a short stretch near the Texas border most of Louisiana's coastal region is bounded by marshland. Some isolated barrier islands exist to the east and west of the Mississippi River delta.

Of note is the chronic occurrence of tar balls on the gulf front beaches and barrier islands of south Texas. Investigators have attributed the principal cause to natural hydrocarbon seeps and shipping; however, existing petroleum development in the marine environment has probably contributed to this problem (Sweet, 1974; and Jeffrey, 1973). Historical accounts have shown that the Karankawa Indians used asphalt found on

Table 10
Shoreline Information for the Gulf of Mexico

Location	Area			Ownership			Use			
	Shore (mi)	Beach (mi)	Non-Beach (mi)	Federal (mi)	Public (mi)	Private (mi)	Public (mi)	Private (mi)	Non-Recreational (mi)	Undeveloped (mi)
Gulf										
Alabama	46.4	46.4	0	.4	4.8	41.2	4.0	30.3	2.0	10.1
Mississippi	33.2	27.0	6.2	15.3	0.6	17.3	0	6.9	0	26.3
Louisiana	810.0	365.0	445.0	160.1	181.9	468.0	7.5	2.1	7.2	93.2
Texas	373.0	361.0	12.0	96.0	12.0	265.0	270.0	41.0	0	62.0
Sub-Total	1,262.6	799.4	463.2	271.8	199.3	791.9	281.5	80.3	9.2	191.6
Bays and Estuaries										
Alabama	305.3	180.6	124.7	1.9	7.9	295.5	27.6	179.6	3.0	95.1
Mississippi	213.8	69.8	144.0	17.9	41.9	154.0	31.0	99.0	9.5	74.3
Louisiana	1,133.0	470.0	663.0	85.4	150.0	897.6	10.3	26.1	39.1	1,057.5
Texas	2,125.0	16.0	2,109.0	292.0	43.0	1,790.0	116.0	119.0	107.0	1,783.0
Sub-Total	3,777.1	736.4	3,040.7	397.2	242.8	3,137.1	184.9	423.7	158.6	3,009.9
Total	5,039.7	1,535.8	3,503.9	669.0	442.1	3,928.6	466.4	504.0	167.8	3,901.5

Source: U.S. Department of the Army, Corpos of Engineers, 1973.

Texas beaches to water proof and decorate pottery. Early Spanish explorers likewise made use of the natural tar in patching ship leaks.

GULF OF MEXICO

Last but not least, the most prominent recreational resource most directly associated with this proposal is the Gulf of Mexico itself. The exclusive domain of no single nation, political subdivision or individual it is enjoyed in a recreational sense primarily for its beauty, its inhabitants and its water.

(2) *Coastal Recreation Activities*

The diverse environments found in areas where water and land converge present an interesting setting for leisure pursuits. The coastal beaches, barrier islands, estuarine bays and sounds, and tidal marsh from Port Isabel to Perdido Bay contribute to an atmosphere supportive of water-dependent and water-enchanced outdoor recreation activities.

Traditionally the shoreline of the central and western Gulf has provided residents of coastal states and tourists with an opportunity to enjoy and participate in a wide range of beach related activities. A precise accounting of the scope of this public use is difficult.

Several publications, however, provide some insight into the scope and value of marine recreational pursuits, especially saltwater fishing. Table 11 presents some of the results of a National Marine Fisheries Service (NMFS) sponsored study which attempted to estimate participation by state in some of the most popular recreational activities associated with the marine environment in the southeastern U.S. (U.S. Dept. of Commerce, NOAA, 1977a). Another NMFS sponsored study (U.S. Dept. of Commerce, NOAA, 1977b) aimed at determining the economic implications of marine recreation estimated that 1975 consumers, nationwide, purchased an estimated $1.8 billion worth of goods and services at the retail level which are directly associated with marine recreational fishing. Private boats and related expenses (motors, trailers, insurance) accounted for 35 percent of the total expenditures. This study noted that marine recreational fishing in the region extending from the Mississippi Delta to the Rio Grande accounted for 12 percent of the total national estimate, or over $200 million in economic activity in the same area where this oil and gas lease is proposed.

One other study, the 1975 National Survey of Hunting, Fishing and Wildlife—Associated Recreation (U.S. F&WS, 1977), estimated nationwide 16.4 million anglers participated in 207.2 million days of saltwater fishing in 1975 and spent $3.45 billion exclusive of license fees in this pursuit. Assuming, in accordance with the NMFS estimate that 12 percent of the nationwide saltwater fishing takes place in the marine environment between the Mississippi Delta and the Rio Grande, than the Fish & Wildlife Service's estimates show an even greater value associated with marine recreational fishing assessing net worth at approximately $400 million dollars annually in the area proposed for this lease sale. Although regional estimates in scope and value of marine associated recreation vary widely, it is generally accepted that the number of people affected by the recreational resource associated with the marine environment is significant.

The Texas Outdoor Recreation Plan (Texas Parks and Wildlife, 1975) projected an annual participation rate of nearly 60 million activity days of recreation in its 17 county coastal region for 1975. Projections show almost 85 million recreation activity days expected in 1980 and 170 million recreation activity days by the year 2000. These figures include participation by residents, non-residents and tourists. Estimates indicate the most popular recreational activity is fishing with 17,780,800 activity days in 1975, followed by swimming (15,894,100), picnicking (7,175,100), boating (5,923,600) and camping (4,698,600).

Although recreation use figures pertaining specifically to Louisiana's coastal region are not provided in the Information Base for Executive Decision of Louisiana's Statewide Comprehensive Outdoor Recreation Plan (SCORP, 1977), they do provide participation rates by activity for a percent of the estimated 1975 statewide population. Choosing those activities which are known to occur exclusively or primarily in Louisiana's coastal zone we can make the following computation shown in Table 12.

A very conservative estimate of water oriented outdoor recreation in Louisiana's Coastal Zone would amount to 9 million recreation days. An independent estimate of the recreation occurring in Louisiana's extensive marsh zone came up with a figure of 10 million man-days of sport activity annually (Davis and Detro, 1975).

Table 11

Marine Recreational Activity, 1974

	Activity*						
Resident	Finfishing	Shellfishing	Swimming	Sailing	Pleasure Boating	Beach Combing	Diving
Alabama	442,000	239,000	906,000	80,000	413,000	626,000	40,000
Louisiana	606,000	609,000	721,000	109,000	539,000	526,000	54,000
Mississippi	285,000	183,000	335,000	44,000	220,000	266,000	15,000
Texas	1,729,000	1,062,000	2,545,000	365,000	1,158,000	2,237,000	145,000
Total	3,062,000	2,093,000	4,507,000	598,000	2,330,000	3,655,000	254,000

Source: U.S. Dept. of Commerce, NOAA/NMFS, 1977.

Notes: *Estimated number of people participating.

Table 12

Recreational Participation in Louisiana's Coastal Zone

Activity	1977 Participation Rate	1975 Population (Number)	Participation (%)	Annual Participation (Number)
Saltwater Fishing	2.22	3,460,500	30	2,283,930
Swimming (Gulf)	2.01	3,460,500	20	1,391,121
Crawfishing	1.96	3,460,500	31	2,102,599
Crabbing	1.92	3,460,500	29	1,926,806
Waterfowl Hunting	1.65	3,460,500	21	1,199,063

Source: SCORP (1977).

The states of Mississippi and Alabama have a limited marine exposure in comparison to Texas and Louisiana; consequently, their statewide participation rates do not reflect as strong a dependence on beachfront recreation activities for satisfying in-state recreational demand. As would be expected however, planning regions in the coastal sections of both states show high use and demand especially from out-of-state visitors for beach recreation activities (Ala. Dept. of Conservation & Natural Resources, 1971; King, 1971).

In summary, fishing, swimming, beach use, and boating are the major recreational activities in the Texas, Louisiana, Mississippi and Alabama Coastal Zone. All projections and trends indicate a significant increase in demand for these same activities through the end of this century or throughout estimated production life of this oil and gas lease proposal.

RECREATIONAL BOATING AND SPORT FISHING

The area most directly influenced by offshore oil and gas development is the marine environment itself, or, for purposes of this discussion, the neritic zone. The nearshore and offshore waters of the central and western Gulf serve as the basis for two major marine outdoor recreation activities common to all four states—boating and recreational fishing. Likewise, participation in SCUBA diving is rapidly increasing. Visual 4 depicts many of the major natural banks and artificial fishing areas attractive to offshore sport fishermen and SCUBA divers.

A 1973 National Marine Fisheries Service study provides a general overview of recreational boating in the U.S. and its subdivisions, including the states bordering the Gulf of Mexico (Ridgley, 1975). Ridgley estimated that approximately 350,000 or 12% of all private recreational boats in the Gulf States region were utilized in saltwater recreation. The U.S. Coast Guard (U.S. Dept. of Transportation, 1977) recently estimated that 10 percent of the boating population operates 3 or more miles from shore in coastal waters. Based on 1976 boat registrations which includes all boats equipped with propulsion machinery, approximately 100,000 recreational boats are utilizing the offshore waters of the central and western Gulf. Undoubtedly almost all of these boaters are also recreational fishermen.

Studies by the National Marine Fisheries Service indicate marine recreational fishing in the Gulf of Mexico associated waters is not only popular but productive. Deuel (1973) estimated that 872,000 Gulf fishermen caught approximately 60 million kg of fish which gives an average yearly catch of about 70 kg per fisherman. The average fish weighed 0.7 kg and the most likely catches included sea trout, drums, croakers, snappers, kingfish, flounders, grunts, and catfishes. Besides private boats, charter or party boats, bridges, piers, jetties and beaches were the principal methods of fishing. Investigations by Ditton (1977) and Veal (1977) into the scope of charter boathead boat enterprises indicate 88 boats operate along the Texas coast and 36 along the Mississippi coast. An estimated 30 boats operate along Louisiana's coast. Over 150 recreational fishing boat-for-hire businesses, most of which cater to offshore marine recreational fishermen, are established along the central and western Gulf. Other more localized studies by the National Marine Fisheries Service and investigators representing the states of Texas, Mississippi and Alabama (Texas P&W, 1976; Daniel and Seward, 1975; Jackson, 1972; Wade, 1976; and Ditton, Jarman and Woods, 1977) have estimated efforts, catches, and values relating to recreational fishing in specific areas of the central and western Gulf of Mexico. These studies and others have demonstrated that marine sport fishing is increasing in popularity, is very productive and rewarding to participants, and has a significant effect on coastal economies.

Although most marine recreational fishermen confine their fishing to inland bays, sounds, and nearshore waters, more and more fishermen are extending their fishing ranges to include offshore fishing areas. Besides the natural banks and reefs such as the flower gardens which have attracted commercial and a few sport fishermen or divers for many years, artificial reefs developed in the OCS are attracting more and more marine anglers. Offshore mineral development in the past 25 years has led to the erection of over 1000 major platforms in the Gulf of Mexico, most of which are in the central Gulf off the Coast of Louisiana. One isolated area of concentrated oil and gas development on the OCS off Freeport, Texas, known as the Buccaneer field complex, has become recognized over the years as a special area of interest to Texas fishermen, SCUBA divers, and marine researchers. The area has even been identified for nomination consideration as a

National Marine Sanctuary. Besides functional petroleum structures, the states of Texas, Mississippi and Alabama have all developed artificial fishing reefs made of ships, barges, tires and concrete and placed these artificial reefs several miles off their coastlines. Now most of the offshore recreational fishing in the central and western Gulf, except big game fishing, is focused around petroleum structures and designated artificial fishing reefs (Visual No. 4).

Big game or bill fishing has also increased in popularity over the last few years. Most big game fish are pelagic; consequently recreational fishermen pursuing them travel far offshore trolling throughout the central and western Gulf for fish such as tarpon, marlin, sailfish, dolphins, and tuna. The National Marine Fisheries Service has been tracking success ratios of big game fishermen in the Gulf of Mexico since 1972. Their 1976 Newsletter provides some insights into the relative abundance and catchability of billfish by species in the central and western Gulf (Beardsley et al., 1977). The increasing number of big game fishing tournaments attests to the growing interest in this sport. Waters off the Mississippi Delta and southwest Texas are very popular fishing locations; however, more boats are trying new methods and areas every year.

Besides fish several other creatures of the Gulf are the object of many outdoor recreation occasions in the Gulf south. Non-commercial crabbing, shrimping, oystering and shell collecting are popular pastimes in many nearshore areas of Texas, Louisiana, Mississippi and Alabama.

d. CULTURAL RESOURCES

A March 13, 1978 Opinion (No. 76-2151) in the case of Treasure Salvors, Inc., vs. The Nuestra Senora de Atocha rendered by the U.S. Court of Appeals, Fifth Circuit, concluded that the Antiquities Act of 1906 (16 USC 431 et seq.) does not apply to the Outer Continental Shelf. This ruling would indicate that important cultural resources discovered on the OCS are not the property of the United States Government

(1) Procedures Used to Identify Cultural Resources

The wreck of an ancient ship is an artifact representative of the culture at a particular point in time. Additionally, underwater preservation is a valuable medium because many items found aboard ship were sunk before their utility had been exhausted. Because of these reasons, a wreck has been likened to a latent time capsule which can be studied in order to learn more about a by-gone era.

Consequently the Department of the Interior contracted with Coastal Environments, Inc. (CEI), to make a general evaluation of the cultural resources in the northern Gulf of Mexico and attempt to predict broad areas where historic and prehistoric resources are most likely to be located.

The report resulting from this study, "Cultural Resources Evaluation of the Northern Gulf of Mexico" (CEI, 1977) established dimensions on the archaeological potential of the Gulf of Mexico and developed a framework for continental shelf archaeology. It further identified two types of cultural resources likely to be encountered within the proposed lease area: (a) historic cultural resources, or the relics of maritime wreckage, mainly shipwrecks, and (b) prehistoric cultural resources or potential traces of heretofore undescribed human civilizations. Much of the information in this description is borrowed from CEI's report.

As additional sources of information, adjoining states were contacted for any additional current data on cultural resources relative to the Gulf Coast area bordering their state. The state of Texas presently has an on-going underwater archaeological program and to date have precise locations on 399 historic (Pre-20th Century) shipwreck sites. Furthermore, they have some reference to a total of almost 1,000 shipwrecks in Gulf coastal waters off Texas.

Additionally, the National Register of Historic Places was consulted along with the State Historic Preservation Officers for Mississippi, Alabama, Louisiana and Texas (Sec. IX) to identify significant cultural resources which might be affected by an offshore oil and gas lease sale in the central and western Gulf region. Visual 4 depicts the location of National Register sites in the coastal areas of the planning region as well as indicating the general location of reported shipwrecks on the Outer Continental Shelf.

(2) Cultural context

Research on known cultural resources indicates that man has existed in the gulf coast area for at least 12,000 years or more. Some scattered and fragmentary evidence suggests 20,000 or more years. During this period, the sea level has been at varying levels, suggesting that when man arrived on the scene he most likely settled at a site both accessible to the sea and determined by the existing landforms. As the sea gradually moved further inland, so too did man, leaving behind artifacts indicative of his presence. The present sea level was reached at about 2,500 years ago. The possibility of drowned habitation sites occurring during the period is from about 20,000 years to 2,500 B.P. A good probability exists for their occurrence from about 12,000 years to 2,500 years B.P.

Volume I of CEI's report provides a synthesis of the known archaeological record for the entire Gulf Coast region and relates coastal artifact traditions and cultural sequences to prehistoric geological times and events. It goes on to provide an interpretation of Quaternary sea level fluctuations relating to the geomorphology of the Outer Continental Shelf and forms the basis for establishing the seaward limits for the most probable area of former human habitation sites. The cultural resource demarcation line depicted on Visual Nos. 1 and 4 is a reflection of those "high probability" limits.

With the discovery of the New World, the Spanish, French, and English ships started crossing the ocean to the Gulf Coast areas. As they expanded their trade endeavors, the Gulf became a criss-cross of shipping lanes between ports along the way. Inevitably, shipwrecks occurred, and the earliest known shipwreck happened in 1520. As commerce and technology increased, ships were designed to meet the cargo and passenger-carrying capacity. Many of these ships and their cargoes have been lost to storms, other marine hazards, and hostilities in the Gulf of Mexico and along the Gulf Coast. However, due to the inaccuracy of longitudal measurement technology of that era (and even as late as WW II) shipwreck location sites were fragmentary at best. Verbal descriptions of near-locations were attempted as best as could be determined.

The Civil War also increased the number of wrecks throughout the offshore area due to hostile naval operations, along with increased commercial traffic. Finally World Wars I and II added numerous wrecks from natural and combat (mostly submarine) related activities. It should be noted that some obsolete and derelict ships of former and recent times were disposed of routinely by intentionally sinking them in the Gulf of Mexico.

(3) *Summary of known cultural resources*

SHIPWRECK SITES

CEI's Volume II presents a comprehensive report on the occurrence of known historic shipwrecks in the northern Gulf of Mexico from 1500 A.D. Both published and unpublished reports of shipwreck losses and locations were utilized as data sources. Approximately 750 ships with reference dates are reported lying somewhere in the central and western Gulf, of which 90 percent date from the 19th and 20th centuries. The remainder date from the 16th, 17th, and the 18th centuries. Some 350 additional shipwrecks without date references have been inventoried in the planning region.

An estimated two-thirds of the total number of wrecks in the entire northern Gulf are within 1.5 kilometers of the coast but the number of known wrecks decreases very rapidly from shore. About 15 percent of known wrecks are associated with approaches to seaports, straits, shoals, reefs, and along well established sailing routes. The largest concentrations of historically significant wrecks appear to be around major ports such as Galveston and the entrance to major river systems such as the Colorado and Mississippi. Therefore, only a very small percentage of known shipwrecks occur on the Outer Continental Shelf where the Federal government leases mineral development rights. The only location on the National Register of Historic Places which is on the Outer Continental Shelf is the site of the U.S.S. Hatteras, a Union vessel sunk by the U.S.S. Alabama during the Civil War. This site lies about 20 miles south of Galveston. An underwater area near Mansfield Cut known to contain several colonial era shipwrecks and the site of the U.S.S. Tecumseh, in Mobile Bay are the only other underwater sites on the national register within the planning region for this proposal.

HABITATION SITES

An examination of offshore and inshore lands oftentimes reveals similarities in cultural manifestations which indicate both areas may have been exposed at the same time and now harbor relics of a distant past. For example, megafauna and freshwater snail deposits have been found in the Fathom Bank in Central Florida, which indicate a previous freshwater environment. In some cases, as the waters shifted and receded continuously, bars, ridges, barriers and lagoons were left behind. Pond marls have provided remains of many plants and animals. These contour forms occur throughout the western Gulf coastline and enhance the potential for occurrence or remains of any earlier people, fauna, and flora. In addition, they provide useful analytical indicators of previous environmental use patterns.

To date no known underwater human habitation sites have been discovered and reported on in the north central and north western Gulf of Mexico. In addition to known shipwrecks and nearshore archaeological sites, the coastal shoreline of the central and western Gulf displays historic relics of our early American heritage. Prominent among such historic resources are lighthouses and forts, many of which are included on the National Register of Historic Places.

(4) *Summary of unknown cultural resources*

SHIPWRECKS

Except for the small percentage of shipwrecks with reported locations on the OCS, very little is known of the location of numerous other vessels sunk somewhere in the northwestern Gulf. Earlier vessels, lacking communications and sufficiently advanced technological equipment, sank without specific identification of the wreck locations. Vessels were often abandoned before sinking, leaving the ship to finally go down after drifting to an unknown location. A knowledge of the location of a sinking is frequently not the actual location of the wreck, which may have floated beneath the surface for some time, or which may have moved along the bottom due to the effects of storms or currents. Many ships are buried not only by the sea but by layers of marine sediment as well. Of the estimated 750 ships known to have been lost in the northwestern Gulf almost 700 of those ships have no definite sinking locations and are merely associated with a proposed destination site or the nearest port where survivors may have reported a loss. In the case of earlier century losses, whole areas may have been identified by a major port. Additionally, other shipwrecks have been located but not identified or classified into an historical period. Approximately 300 known ships in the eastern Gulf fell into this category.

HABITATION SITES

Although the former existence of human habitation sites on the Outer Continental Shelf has been demonstrated by Coastal Environments, Inc., little direct evidence has been produced to date. However, current techniques utilizing remote sensing tools are providing additional data which many ultimately help to substantiate the former existence of human habitation on the Outer Continental Shelf.

E. TRANSPORTATION

(1) *General*

The ports and magnitude of water-borne traffic along the Gulf coast from Mobile to Brownsville are shown in tables 13 and 14.

Of the 468 million tons (424 million metric tons) of freight that passed through the 16 ports and harbors in 1973 as shown in table 13, 221 million tons (200 million metric tons) or over 47 percent were crude oil and petroleum products. Also, of these same 468 million tons of freight, 150 million tons (136 million metric tons), or approximately 32 percent moved in foreign trade; 36 million tons (32 million metric tons) were crude oil and petroleum products.

The importance of the petroleum-related industries can also be seen in table 14. Of the total tonnage handled at the major Gulf Coast ports from Mobile through Brownsville, approximately 24 percent consisted of ''Crude Petroleum'' (Standard Industrial Classification, SIC 13), and 26 percent consisted of ''Petroleum and Related Industries'' (SIC 29).

Tables 13 and 14 also serve to illustrate the changes in shipping traffic that took place between 1973 and 1974. These changes included a growth of 103 percent in petroleum products in foreign trade. A large part of this growth was in imported foreign crude oil. The importance of foreign petroleum shipping to total tonnage grew from 8 percent to 14.5 percent in just two years.

The gulf coastal zone is well served by all forms of transportation. An extensive network of highways and rail lines connect all major ports with inland areas. Transportation throughout the coastal counties is primarily via roads and highways.

Because of their geographic location, the coastal counties are also served extensively by waterborne transportation systems. A number of important U.S. ports are within this area.

The Port of New Orleans is the second largest, Houston is the third largest, and Corpus Christi is the ninth largest U.S. port. Deep water ports in

Table 13

Freight Traffic at Major Gulf Coast Ports

Mobile - Brownsville, 1975

				Foreign Trade		
Port	Total (*)	Crude Petroleum (*)	Petroleum Products (*)	Total (*)	Petroleum (*)	Petroleum Products (*)
Mobile	32,452	4,959	3,212	13,301	218	02
Pascagoula	19,951	5,651	8,822	8,051	5,656	70
Biloxi	1,789	00	170	00	00	00
Gulfport	922	00	23	780	00	0.03
New Orleans	140,409	23,295	23,426	47,659	6,135	12.9
Baton Rouge	60,226	7,963	17,097	20,408	4,788	23.5
Lake Charles	17,463	9,391	3,703	5,680	4,386	77.2
Orange	912	51	65	89	00	00
Beaumont	30,583	11,037	11,981	9,999	6,063	60.6
Port Arthur	26,598	10,946	9,053	10,338	8,834	85
Houston	83,674	19,009	26,536	36,274	14,513	40
Texas City	23,864	9,085	9,246	6,194	5,459	88
Galveston	5,971	250	177	3,946	191	05
Freeport	8,194	3,851	740	4,113	3,019	73
Corpus Christi & Harbor Island	41,836	16,717	14,212	20,956	11,961	57.1
Brownsville	2,829	42	1,175	1,639	847	51.7
TOTAL	497,673	122,247	129,638	189,427	72,052	38

Source: U.S. Dept. of the Army, Corps of Engineers, 1975.

Notes: *Short tons x 1,000

Table 14

Freight Traffic at Major Gulf Coast Ports
Mobile - Brownsville, 1977

				Foreign Trade		
Port	Total (*)	Crude Petroleum (*)	Petroleum Products (*)	Total (*)	Petroleum (*)	Petroleum Products (*)
Mobile	35,944	3,983	5,309	13,688	45	00.3
Pascagoula	23,833	8,738	7,842	11,192	8,631	77
Biloxi	1,716	10	109	00	00	00
Gulfport	1,095	00	28	991	2	00.2
New Orleans	2,992	29,365	29,596	64,287	17,498	27.2
Baton Rouge	70,008	12,174	18,771	25,505	9,234	36.2
Lake Charles	25,401	12,743	7,796	9,660	7,963	82.4
Orange	1,003	67	85	25	00	00
Beaumont	48,919	28,524	12,840	26,804	23,787	89
Port Arthur	30,754	15,227	11,113	16,610	384	02
Houston	104,291	31,776	33,965	51,041	29,310	57
Texas City	33,584	15,391	11,361	13,054	12,116	93
Galveston	9,564	510	303	7,575	510	07
Freeport	15,333	10,294	994	11,417	9,957	87
Corpus Christi & Harbor Island	56,041	27,105	18,030	31,611	23,092	73
Brownsville	2,130	5	677	1,132	409	36
TOTAL	462,608	195,912	158,819	284,592	142,938	50

Source: U.S. Dept. of the Army, Corps of Engineers, 1977.

Notes: *Short tons x 1,000

Texas include: Beaumont, Brownsville, Corpus Christi, Freeport, Galveston, Houston, Orange, Port Arthur, Port Isabel, Point Comfort, Texas City and Sabine Pass Harbor.

(2) *Texas*

HIGHWAY TRANSPORTATION

Highways form the backbone of the transportation system serving the land areas within the coastal zone. Most of the 19,308 km of highways crisscrossing the coastal zone are presently operating less than half of their capacity in rural areas; however, traffic volumes increase sharply as these highways approach urban areas.

RAIL TRANSPORTATION

The Texas Coastal Zone is served by an extensive network of railroads that connect the region to the rest of the State and the nation. The 4,809 km of main-line tracks represent more than 21 percent of all railroad kilometers in Texas.

A total of 55 million tons (50 million metric tons) of rail freight is estimated to originate, terminate, or pass through the Coastal Zone each year. This represents about 28 percent of all rail freight tonnage reported by Texas railroads. The bulk of this rail traffic is estimated to be in corridors connecting the Coastal Zone to other regions.

The heaviest rail traffic occurs in the corridor connecting Houston to Dallas-Fort Worth area and points north. An estimated 21 million tons (19 million metric tons) per year are carried in this corridor. None of the rail corridors serving the Coastal Zone are presently operating at more than 20 percent of the basic capacity provided by the rail lines.

AIR TRANSPORTATION

Eight airports in the coastal zone are presently served by scheduled air passenger service. Almost three million passengers boarded planes at these airports in 1970.

PIPELINE TRANSPORTATION

The total capacity of pipelines entering or leaving the coastal zone is sufficient to transport more than 150 million tons of crude oil and petroleum products each year.

PORT FACILITIES

Texas ports handle three basic types of waterborne traffic: foreign, domestic and internal. Of the total tonnage handled 64 percent was shipped out, and 36 percent was received.

Of the ocean traffic, about two-thirds is domestic commerce and the remainder is in foreign trade. The bulk of this outbound tonnage is liquid petroleum products.

The waterway traffic is primarily on the Gulf Intracoastal Waterway, which extends from Brownsville, Texas, to Apalachee Bay, Florida. Its 1791 km of canals, of which 681 km are in Texas, connects all ports on the Gulf of Mexico to more than 9654 km of inland waterway centering on the Mississippi River. Recent industrial expansion in the Texas coastal zone has been closely related to the waterway, as more than four out of every five additional tons of waterborne traffic developed in the past 15 years have been on the canal.

No locks are required through Texas, as all portions of the canal are at sea level. Almost 70 million tons (64 million metric tons) of goods were loaded onto or unloaded off of barges at Texas ports each year from 1967 to 1970.

A deepwater offshore oil terminal proposed by Seadock, Inc. The Secretary of Transportation offered a license to Seadock, Inc. to construct and operate the proposed facility. Seadock, Inc., did not accept the terms of the license and disbanded. The Texas Deepwater Port Authority has taken over the project.

About 36 million tons (33 million metric tons) of waterway traffic crossed the Texas-Louisiana border in 1970, about 60 percent of which was coming into Texas.

Since approximately half of the nation's petrochemical industry and one-fourth of its refining capacity is located in the Texas coastal zone, products from these industries comprise the bulk of total waterborne tonnage for both ocean-going and barge traffic. Of the total tonnage transported on Texas sections of the Intracoastal Waterway, approximately 22 percent consisted of "Crude Petroleum" (SIC 13), and 33 percent consisted of "Petroleum and Related Industries" (SIC 29).

Including the petrochemical industry, it has been estimated that approximately 85 percent of all tonnage handled at Texas ports consists of crude oil or petroleum products.

The following description of Texas ports was abstracted from a publication by the U.S. Department of the Army (1973).

PORT ARTHUR

The principal waterborne commodities handled at the port are crude petroleum, petroleum products, and chemicals. Storage facilities include about 25,932,000 barrels of capacity for crude oil and refined petroleum products. Railroad facilities include about three km of marginal trackage. Three federal highways and state highways connect Port Arthur with other parts of Texas and the United States.

ORANGE

The principal waterborne commodities handled at the port are shell, crude petroleum, and chemicals. There are 35 piers, wharves and docks. Storage facilities include transit sheds and about 447,000 barrels of storage capacity for crude oil and refined petroleum products. The Orange area is served by Interstate Highway 10, U.S. Highway 90, two railroad companies and other state highways.

BEAUMONT

The principal waterborne commodities handled at the port are crude petroleum, petroleum products, chemicals, liquid sulfur and wheat. Storage facilities include elevators for grain, dry storage space, and about a 39,500,000 barrel capacity of storage tanks for crude oil and refined petroleum products. The port area of Beaumont is served by several railway companies. Interstate Highway 10 and several U.S. and state highways connect Beaumont with other points of Texas and the United States.

GALVESTON

Storage facilities include grain elevators, dry storage, cooler and freezer space, storage tanks for liquid sulfur, and storage facilities for dry sulfur. Waterfront terminals at Galveston are served by a railroad which connects with several other railroads serving Galveston and the port area. Interstate 45 and State Highway 87 also connect Galveston with the Texas mainland.

HOUSTON

The Houston Ship Channel affords access for ocean-going vessels from the Gulf of Mexico to Houston. It also provides access to barge traffic from the Gulf Intracoastal Waterway. Some of the principal commodities handled at the port are petroleum and petroleum products, sand and shell, fertilizer and fertilizer materials, steel mill products, grain, sulfur, clay and earths, and chemicals. There are 218 piers, wharves and docks in the vicinity of the port of Houston.

Storage facilities include five grain elevators, 21 warehouses, cooler and freezer space, and about 11,928,000 barrels of storage tanks for crude oil and refined petroleum products. The port area of Houston is served by many railroads. Two interstate highways connect Houston with other points in Texas and other points in the United States.

TEXAS CITY

The harbor area includes about 11,175,000 barrels of storage for crude oil and refined petroleum products. The Texas City Terminal Railway has marginal tracks in the vicinity of the harbor area and connects with other railroads. State Highway 197 connects the Texas City area with other state and Federal highways.

FREEPORT

Freeport is a major port for shipping chemicals and petroleum products. Storage facilities include about 20,066 m² of transit sheds, private storage facilities for about 700,000 barrels of crude oil, and for about 1,350,000 barrels of petroleum products. Railroad facilities include about 914 m of marginal trackage. Federal and state highways connect Freeport with other parts of Texas and the United States.

MATAGORDA

The Matagorda Ship Channel (Point Comfort) is located about 120 miles southwest of Galveston and covers an area from the jetties in the Gulf of Mexico through Matagorda Peninsula and across the southwestern portion of Matagorda Bay, including the turning basin at Point Comfort.

The waterfront facilities at Point Comfort, exclusive of shallow-draft channels and turning basins, consists of a public turning basin with approximately 3,000 lineal feet of usable berthing space and about 31,125 square feet of transit shed. Railroad facilities include trackage connecting to the Missouri-Pacific Railroad. State Highway 35 is the primary highway in the Point Comfort area.

CORPUS CHRISTI

Storage facilities include about a 25,430,000 barrel capacity of storage tanks for crude oil and refined petroleum products.

All of the publicly-owned, as well as some of the privately-owned waterfront terminals at the port of Corpus Christi are served by terminal trackage. Several U.S. and state highways connect with other parts of Texas and the United States.

BROWNSVILLE

Brownsville is the southernmost port in Texas and the southern terminus of the Gulf Intracoastal Waterway System.

The main harbor consists of about 5 km of improved waterfrontage, cargo docks, covered and open storage, and grain storage. Railroad service to the harbor is provided by three companies and it is also served by state and federal highways.

(3) *Louisiana*

The major arteries of Louisiana are the rivers and waterways, and the Mississippi River is the principal route. Southern Louisiana is crossed by Interstate 10 and routes I-12 and I-55 serve the southeastern area. The highway transportation system is supplemented by the intracoastal waterway, air, and rail transportation.

HIGHWAY TRANSPORTATION

In the coastal zone, Louisiana maintains more than 9,700 km of non-rural roadway. The coastal zone also has more than 11,300 km of local rural roads.

The area along the coast generally has suffered from a lack of feeder roads. This is traceable to the fact that soil conditions in the area make road construction costly.

RAILROAD TRANSPORTATION

In 1970, there were more than 6,900 km of main line tract in Louisiana.

The primary east-west line in the coastal parishes is Southern Pacific, which runs from New Orleans westward to Morgan City, Lafayette, Lake Charles and ultimately to California. The main line roughly parallels the coast but is located well inland.

The Missouri Pacific traverses an east-west route roughly parallel to U.S. 190.

Texas Pacific serves the western bank of the Mississippi River as far south as Venice, Illinois Central also provides a north-south line from New Orleans to Chicago, Illinois. Southern Railway System and the Gulf, Mobile and Ohio Railroad Company provide north-south service around the eastern end of Lake Pontchartrain. The Louisville and Nashville Railroad provides service from New Orleans eastward along the Mississippi Gulf Coast.

AIR TRANSPORTATION

The coastal zone of Louisiana is served by four commercial airports. They include:

Baton Rouge - Ryan Field
Lafayette - Lafayette Municipal Airport
Lake Charles - Lake Charles Municipal Airport
New Orleans - Moisant (New Orleans International) Airport

Numerous other cities and towns, have unlighted, hard surface, landing strips or airports. However, most of the air facilities are located at least 16 km inland. A number of heliports and seaplane facilities have been constructed on the coast. They are generally concentrated around Morgan City, Grand Isle and Venice and serve the petroleum industry as refueling stops for aircraft transporting workmen to offshore oil rigs from other airports in the more populated areas.

PIPELINE TRANSPORTATION

There are 31 gas transmission companies operating in Louisiana and 34 petroleum and petroleum product pipeline companies. Most pipelines are automated.

That network is likely to grow for natural gas activity and stabilize for petroleum activity based on production predictions prepared by Associated Louisiana Planning Consultants, Incorporated for the Comprehensive State Plan.

Development of a deep-draft port in the Gulf of Mexico in the vicinity of the Mississippi River may anticipate construction of connector pipelines to the offshore terminal as the main method of moving bulk liquids.

PORT FACILITIES

At least 8000 km of navigable streams and 1,800 km of intercoastal waterways are located in the state (Louisiana Planning Corporation, 1972). These waterways include the Mississippi River and the Gulf Intracoastal Waterway which are major waterways for the nation's waterborne commerce. Other notable waterways include the Calcasieu, Atchafalaya, Ouachita, Mermentau, Vermilion, and Pearl Rivers, Barataria Bay, Bayou Lafourche, the Houma Navigation Canal, the Mississippi River - Gulf Outlet and the Bayous Petit Anse, Tige, Carlin and Teche.

Several major ports have developed in southern Louisiana. Three of these, New Orleans, Baton Rouge, and Lake Charles, rank among the major ports of the United States.

New Orleans is the largest port on the Gulf of Mexico. Upstream from New Orleans on the Mississippi River is the Port of Baton Rouge, the seventh ranked port in the nation in terms of tonnage. Bulk cargoes, petroleum and petroleum products, grains, and ores flow through these ports. Lake Charles, the state's third deepwater port, ranks twentieth in the nation. Lake Charles has bulk cargo operations consisting primarily of petroleum and its derivative products, as well as moderate amounts of general cargo.

A deepwater offshore oil terminal has been proposed for construction by LOOP (Louisiana Offshore Oil Port), Inc. A license for construction and operation of the proposed port has been issued. Construction is expected to commence in late 1978 and port operations are expected to begin in 1980. The proposed port will be located approximately 18 miles off Lafourche Parish in the Gulf of Mexico. In addition, a 420,000 Mcf per day liquid natural gas terminal is expected to be constructed at Lake Charles in the early 1980's.

NEW ORLEANS

The Mississippi River has a clear and unobstructed channel maintained to a depth of 12 m from New Orleans to the mouth of the river. The frontage for deepwater vessels within the port limits includes approximately 85 km along the river banks, 8 km on the Inner Harbor Navigation (Industrial) Canal, and approximately 10 km on the Mississippi River - Gulf Outlet. The Inner Harbor Navigation (Industrial) Canal in the City of New Orleans connects the Mississippi River with Lake Pontchartrain, the Mississippi River - Gulf Outlet and the Gulf Intracoastal Waterway east of New Orleans.

There are about 295 piers, wharves, and docks in the Port of New Orleans area. Twenty-three waterfront facilities are equipped to receive and/or ship petroleum products; several of these facilities provide bunkering services for vessels. Four companies maintain facilities for public storage, drumming, blending, packaging and distributing of various types of bulk liquids. They operate six wharves along the right bank of the Mississippi River with waterside connections and pipelines extending to storage tanks in the rear with total storage capacity of about 2,839,000 barrels.

The port area is served by six railway companies. Interstate, Federal and state highways connect New Orleans with other points in Louisiana and the United States.

BATON ROUGE

The Port of Baton Rouge, is on both banks of the Mississippi River 418 km from deep water in the Gulf. It is at the head of the deepdraft channel of the Mississippi River. The port is also served by a direct connection with the Gulf Intracoastal Waterway via the Port Allen Lock and the Gulf Intracoastal Waterway Alternate Route which extends from Morgan City to Port Allen.

Thirteen waterfront facilities are equipped to receive and/or ship crude oil and petroleum products. There are about 890 storage tanks capable of storing approximately 23,269,999 barrels of crude oil and petroleum products.

The port is served by the Illinois Central Railroad; Louisiana & Arkansas Railway (Kansas City Southern Lines). Interstate, Federal and state highways connect Baton Rouge with other points in Louisiana and the United States.

LAKE CHARLES

The port of Lake Charles is in the southwestern part of the State of Louisiana and embraces an area of 526 km². The Calcasieu River flows in a southernly direction from the port for a distance of 56 km to enter the Gulf of Mexico.

Storage facilities are maintained for about 13,200,000 barrels of crude oil and refined petroleum products. The port area is served by the Kansas City Southern Railway, the Missouri-Pacific Railroad, and the Southern Pacific Company. Interstate Highway 10, U.S. Highway 90 and state highways connect Lake Charles with other parts of Louisiana and the United States.

The Gulf Intracoastal Waterway, which extends from Apalachee Bay, Florida, to Brownsville, Texas, crosses the Calcasieu River about 18 km below the city of Lake Charles. The Waterway section to the east provides a connection with the Mississippi River System at New Orleans, and westward from the Calcasieu River to the Sabine-Neches Waterway.

INTRACOASTAL WATERWAY

Aside from deep-draft ocean shipping, Louisiana is a key focal point for inland waterway traffic. Inland barge traffic not only links the deepwater ports to the interior of the nation but also provides important support for the industrial structure of coastal Louisiana.

In terms of cargo destined for ocean shipping, the principal commodities carried on the inland waterways are petroleum and petroleum products, grains and grain products, aluminum ores, concentrates and scrap, soybeans, and liquid and dry sulfur. The domestic cargo tonnage moved along Louisiana waterways consists primarily of petroleum and petroleum products, grain and grain products, soybeans, sand, gravel, crushed rock, iron and steel products, sulfur, and other chemicals.

Barge traffic is especially important to the petroleum and chemical industries in Louisiana since it not only supplements pipelines to a considerable extent but also provides low-cost movement of refined petroleum and chemicals to the interior of the nation and to the deep-water ports for trans-shipment. The existence of barge service tends to concentrate petro-chemical facilities adjacent to water sites in Louisiana.

(4) *Mississippi*

HIGHWAY TRANSPORTATION

Highways form the backbone of the transportation system serving the land areas within the coastal zone. Mississippi has 17,561.6 km of highways, with 2,798.6 km within the coastal zone (Mississippi State University, 1974). The Mississippi Gulf Coast is principally served by U.S. Highway 190 and Interstate Highway 10, both of which parallel the coastline in an East-West direction.

RAIL TRANSPORTATION

The Mississippi Coastal Zone is served by three railroads, the Louisville and Nashville, Illinois Central Gulf, and the Mississippi Export. The state contains a total of 5,867.2 kilometers of railroad track. The Louisville and Nashville generally follow the coastline connecting the coastal communities with New Orleans and Mobile and all connecting points. The Illinois Central Gulf is located in Harrison County (Gulfport) and extends northward to the Hattiesburg, Jackson areas. The Mississippi Export serves the Jackson County areas connecting Pascagoula and Moss Point with Lucedale in Stove County and interconnecting with the Gulf Mobile and Ohio Railroad near Lucedale.

AIR TRANSPORTATION

Three types of airport facilities occur in coastal Mississippi: air carrier facilities, general aviation facilities, and military installations. Air carrier airports are located to serve large concentrations of populations and/or commerce. The only air carrier airport in coastal Mississippi is located at Gulfport.

General aviation airports may and frequently do serve smaller population centers or industrial or recreational areas. General aviation airports in coastal Mississippi include Stennis International Airport, Diamondhead Airport in Hancock County, the Gulf Park facility east of Ocean Springs, and the Jackson County Airport. The only major military installation is Keesler Air Force Base.

PIPELINE TRANSPORTATION

There are currently no pipelines moving offshore crude oil or gas into Mississippi.

PORT FACILITIES

In 1973, the ports of Pascagoula, Biloxi, and Gulfport handled a total of 15,112,000 short tons of freight traffic. Of the total, 3,787,000 short tons were in foreign trade (U.S. Dept. of Interior, BLM, 1976).

The major navigation channel in coastal Mississippi is the Gulf Intracoastal Waterway. The waterway links all ports along the Mississippi Gulf Coast with inland waterway systems emptying into the Gulf of Mexico. Other major waterways include the Pascagoula River, Wolf River, Jourdan River, East Pearl River, Pearl River, and the Bayou Portage Channel.

Principal Mississippi Gulf Coast ports are Pascagoula Harbor and Gulfport. Descriptions of these ports were taken from a publication by the U.S. Department of the Army (1973).

(5) *Alabama*

HIGHWAY TRANSPORTATION

Coastal Alabama is served by six U.S. highways, two Interstate highways and a secondary road system consisting of state and county roads. Major U.S. highway routes include U.S. 98, 45, 43, 31, and 90. Interstate highways 10 and 65 serve the area from east-west and north-south directions respectively.

RAIL TRANSPORTATION

Railroads serving coastal Alabama include the Gulf-Mobile and Ohio, the St. Louis-San Francisco, the Louisville and Nashville, and the Southern Railways. In Mobile county railroad lines radiate from the Port of Mobile and from the major industrial centers. The Alabama State Docks Terminal Railway connects these railroads to portside tracks and other marine terminal facilities and industrial locations near Alabama State Docks property.

AIR TRANSPORTATION

Commercial air transportation as in coastal Alabama is available at municipally-owned Bates Field. Three airlines serve the region. Additionally, there are 15 public airfields, three private airfields, and seven military airfields in Baldwin and Mobile Counties.

PIPELINE TRANSPORTATION

There are currently no pipelines moving offshore crude oil or gas into Alabama.

PORT FACILITIES

Alabama's only coastal port is the Mobile.

The Mobile-Tombigbee-Black Warrior River system, which accommodates barge traffic, extends northward from the Port of Mobile to Port of Birmingham. The Gulf-Intracoastal Waterway traverses the southern extremity of the state in an east-west direction.

F. COMMERCIAL FISHING

Locations of royal red shrimp grounds, crabbing areas, and oyster beds are shown on Visual No. 5. Shell dredging areas are also identified. In addition, the NMFS statistical grid zones are delineated and contain a pie-diagram depicting the mean percentage composition by weight of the major species caught during the time period 1968–1974. Also, the mean total weight of the fisheries products caught in that zone are shown.

By far the most productive fishery region of the Gulf of Mexico in terms of pounds caught is the area off Atchafalaya Bay, Louisiana. The adjacent grid zones to the west are the next most productive areas in the northern Gulf. These 3 grid zones accounted for nearly 66 percent of all poundage caught in the Gulf during the 1968–1974 period. The total U.S. commercial landings for 1976 were 5.8 billion pounds (U.S. Dept. of Commerce, 1977a) valued at a record of $1.4 billion to the fishermen. Landings in the Gulf waters of the U.S. accounted for 33 percent or 1.75 billion pounds and 29 percent or 389 million of the total U.S. catch.

The Gulf fishery is dominated by the shell fisheries; shrimp, crabs, and oysters (with smaller amounts of clam and scallops), usually worth three or four times more than the much greater volume of finfish. The shrimp fishery in the Gulf area includes brown (*Penaeus aztecus*), white (*P. setiferus*), and pink (*P. duorarum*) shrimp. These are taken almost exclusively by trawl fishing, in depths ranging from 2 to 73 meters. Other shrimp taken commercially are the sea bobs (*Xiphopenaeus kroyeri*) and royal reds (*Hymenopenaeus robustus*).

The western Gulf shrimp fisheries is comprised mainly of brown and white shrimps. Louisiana contributes nearly half the oysters harvested in the Gulf annually.

The major finfisheries in the western Gulf are for industrial fishes, croaker off Alabama and Mississippi and menhaden (*Brevoortia* spp.) from Mississippi through the area off Galveston, Texas. Further south off Texas the commercial fisheries are completely dominated by shrimp. The industrial fishes are used for pet foods, oils and solubles.

For Gulf-wide finfisheries, the menhaden catch ranks first in value and the number of pounds caught. Shrimp ranks first in dollar value in the Gulf.

Table 15 is a statistical summary of commercial fishery landings, fisherman, plants, and ranking for the Gulf States.

Gunter (1967) indicated that 97.5 percent of the total commercial fisheries catch of the Gulf states is made of estuarine dependent species, that is, fishes or shell fishes that spend all or part of their lives in estuaries. A few species, such as the commercial oyster, live their entire lives in estuarine waters.

On the Gulf coast as a whole, the usual ranking of the most important commercial finfishes is as shown below:

- By volume:
  - Menhaden
  - Mullet
  - Croaker
  - Groupers
  - Spanish Mackerel
  - Spotted Seatrout
  - Red Drum
  - Flounders
  - Black Drum
  - King Whiting
  - White Seatrout
  - Sheepshead
- By value:
  - Menhaden
  - Red Snapper
  - Mullet
  - Croaker
  - Groupers
  - Pompano
  - Spanish Mackerel
  - Red Drum
  - Flounders
  - King Mackerel
  - Black Drum

Table 15
Selected Commercial Fishing Information, 1974

State	Fishermen (Number)	Processed Products (Dollars)	Processing & Wholesale Establishments Plants (Number)	Employment Average Season	Employment Average Year
Florida (West Coast)	7,766	94,532,000	265	4,030	3,468
Alabama	1,766	31,176,000	60	1,641	1,131
Mississippi	1,925	63,075,000	56	1,643	1,168
Louisiana	11,380	156,526,000	211	4,685	3,311
Texas	6,587	88,741,000	150	3,657	2,023
TOTAL	25,489	434,050,000	742	15,656	11,101

Source: U.S. Department of Commerce, NOAA, 1976.

White Seatrout
Sheepshead

G. MILITARY USES

The Gulf of Mexico is used rather extensively by the U.S. Navy and Air Force for conducting military training, testing and research activities. These current activities consist of missile testing, ordnance testing, drone recovery operations, pilot training and electronic counter measure activities by the Air Force Pilot training including air-to-air gunnery, carrier operations and Mine research activities are conducted by the Department of Navy. Most of this activity takes place in areas designated for these purposes (fig. 31). However, live ordnance testing by the Air Force occasionally involves emergency bombing areas. These ordnances range from small munitions to 544 kilogram bombs. The occurrence of unexploded munitions on the ocean floor in the proposed sale area is a possibility in certain locations.

The U.S. Navy has conducted no munitions dumping in water less than 914 m in depth since 1945. The Office of the Oceanographer of the Navy indicates no sites are utilized in the Gulf.

The U.S. Air Force owned and leased approximately 20,235 hectares on Matagorda Island which were used for a variety of military purposes. All of this property has been determined to be in excess of the requirements of the Department of Defense (DOD). Disposal of this property has been cleared with Congressional Armed Services Committees and a Report of Excess has been issued by the General Services Administration (GSA). All military uses of this property ceases as of June 30, 1975. Action is currently underway to clear the property of unexploded ordnance residue (U.S. Department of Defense, 1975).

The excess portion of Matagorda Island features prime recreational and wildlife resources. Currently proposed use plans focusing on the island's major resources are being assessed by GSA in considering reuse and disposal of this former military property.

2. Environmental Quality

A. AIR QUALITY

The air quality of the coastal counties on the northern Gulf of Mexico varies widely by area and season. The relatively large amounts of precipitation periodically cleanse the air of contaminants and the prevailing southerly winds aid in dispersing many of the high air polution concentrations.

Because of the high concentrations of population and industry, the Texas coastal region has great potential for the occurence of air quality problems. The city of Houston and the concentration of industries along the Houston Ship Channel are the two most critical air quality locations and this situation is aggregated by the high relative humidity prevalent in this area. In addition, there are other locations in which frequent air pollution episodes endanger the health and well-being of the public, the Beaumont-Port Arthur-Orange areas, and the Corpus Christi area being of particular concern.

The air quality over most of coastal Louisiana is better than ambient air quality standards in all but a few areas around heavy industrial complexes. Air quality is poorest in the Baton Rouge area near the petrochemical complexes north of the city. At Lafayette, Lake Charles and New Orleans, only suspended particulates consistently exceed ambient standards.

In Mississippi, Harrison County has an air quality problem related to bituminous coal combustion and in Alabama, Mobile County experiences air pollution which is related to industrial fuel combustion.

The Environmental Protection Agency has documented point source emissions for selected coastal states and these are presented in table 16. EPA has also generated emissions estimates for coastal counties and these are presented in tables 17 through 20.

B. WATER QUALITY

The Gulf states—Texas, Louisiana, Mississippi, and Alabama are presently developing Water Quality Management Plans pursuant to Section 303e of the 1972 amendments to the Federal Water Pollution Control Act (P.L. 92-500).

In these plans, each state is divided into hydrological units (basins). These are further divided into sub-basins. The segments of each basin have been analyzed in detail for water quality, and the existing state standards and classification of surface water and segment categorization are evaluated for each segment.

The sub-basins are classified as either water quality or effluent limited. The water quality segments require a significant point source or nonpoint source to be controlled beyond the best

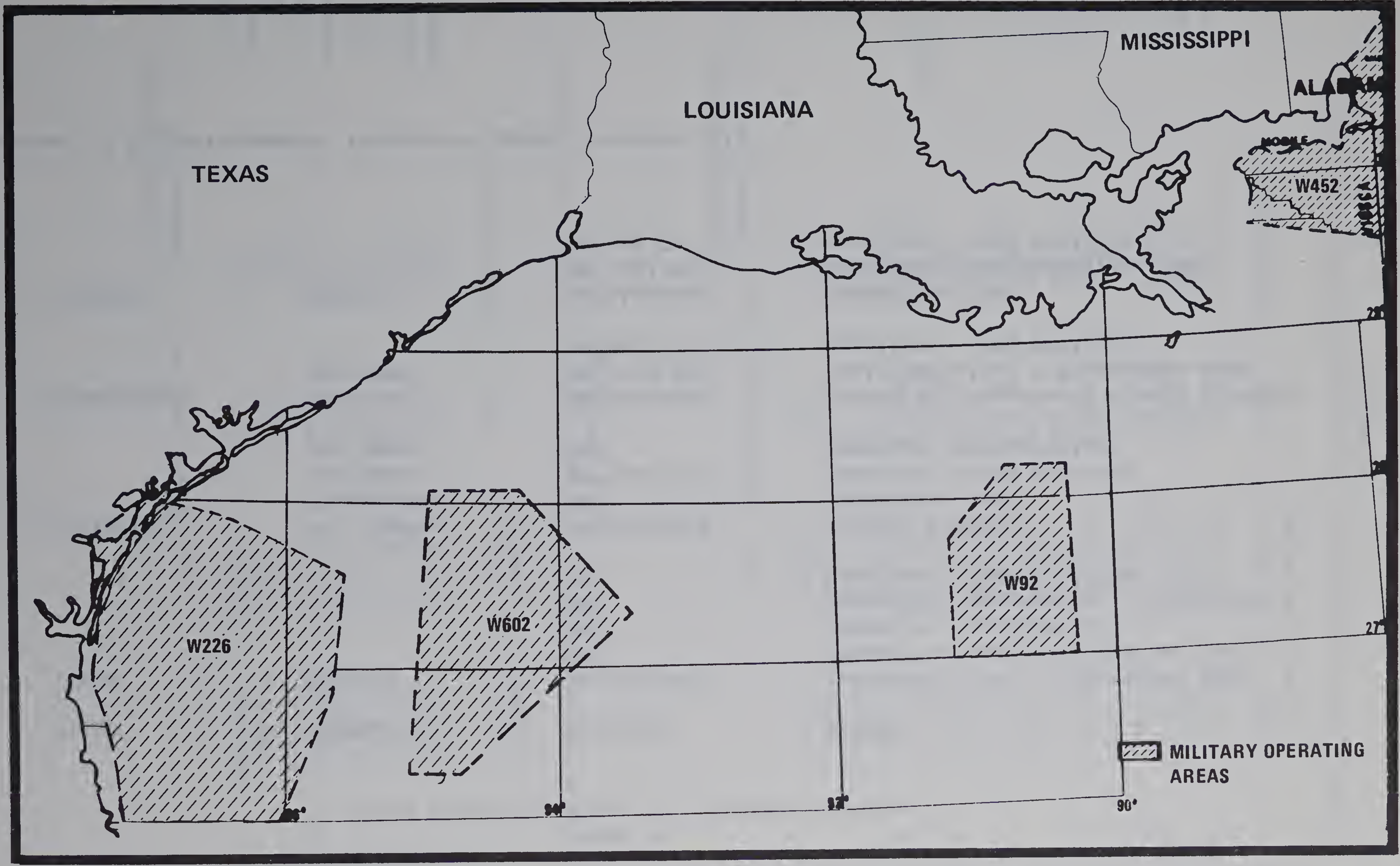


FIGURE 31
WARNING AREAS

Table 16
Point Source Emissions for Selected Counties

State	County	Emission	Source
Texas	Harris	particulate	industrial fuel - bituminous coal
		SO	commercial and institutional fuel
		NO^x	gasoline - land vehicles
		HC^x	industrial processing - evaporation
		CO	gasoline - land vehicles
Louisiana	St. Tammany	particulate	mineral products
	Plaquemines	SO	industrial fuel
	Jefferson	NO^x and HC	gasoline - land vehicles
	St. Mary	CO^x	chemical manufacturing
Mississippi	Jackson	particulate	industrial processing - wood products
	Harrison	SO_x and NO_x	fuel combustion - bituminous coal
		HC and CO	gasoline - land vehicles
Alabama	Mobile	particulate	industrial fuel
		SO_x and NO_x	commercial and industrial fuel
		HC and CO	gasoline - land vehicles

Source: U.S. Environmental Protection Agency, October 1977

Table 17

Estimated Air Pollution Emissions for Selected Texas Counties

County	Emissions (tons/yr) Particulate	SOx	NOx	HC	CO
Jefferson	17,907	121,017	101,486	235,247	303,572
Chambers	1,337	342	23,986	8,744	28,474
Galveston	10,452	27,844	44,825	90,855	274,281
Harris	*134,505	176,371	*206,402	*346,046	*529,124
Liberty	931	228	3,581	3,170	12,231
Brazoria	13,871	16,091	48,170	208,535	157,987
Matagorda	970	380	7,923	13,534	17,377
Jackson	239	90	3,491	3,000	5,377
Calhoun	25,616	2,902	94,858	68,279	15,477
Refugio	262	127	5,162	2,307	5,291
Aransas	218	572	1,612	8,183	134,044
San Patricio	5,694	2,441	78,576	5,259	14,968
Nueces	15,636	14,477	46,324	82,613	126,769
Kleberg	1,738	442	16,333	14,428	16,722
Kennedy	47	56	1,613	4,226	11,790
Willacy	1,009	99	2,268	2,204	6,796
Cameron	2,195	1,631	13,885	25,015	44,416

Source: U.S. Environmental Protection Agency, 1977.
Notes: *Highest recorded.

Table 18

Estimated Air Pollution Emissions for Selected Louisiana Counties

Parish	Emissions (tons/yr) Particulate	SOx	NOx	HC	CO
St. Tammany	6,298	658	5,003	8,486	36,939
Plaquemines	2,687	*19,562	13,728	14,184	26,738
Jefferson	4,119	4,267	*46,121	*45,881	103,209
Lafourche	866	592	5,953	7,670	27,753
Terrebonne	961	780	7,368	10,541	35,811
St. Mary	2,623	2,349	13,839	12,093	*262,745
Iberia	3,561	5,883	6,496	5,813	22,036
Vermilion	990	423	5,850	5,484	20,349
Cameron	251	282	4,009	4,015	12,033

Source: U.S. Environmental Protection Agency, 1977.
Notes: *Highest recorded.

Table 19
Estimated Air Pollution Emissions for Selected Mississippi Counties

County	Particulate	SOx	NOx	HC	CO
			Emissions (tons/yr)		
Amite	751	93	1,207	1,869	7,696
Hancock	622	61	1,050	2,922	13,268
Harrison	5,607	*75,265	*22,141	*14,975	*67,228
Jackson	*7,446	14,193	8,343	25,173	58,197
Marion	1,202	96	1,486	2,912	12,947
Pearl River	971	112	1,921	3,205	14,746
Pike	653	197	2,291	4,184	17,299
Walthall	203	53	1,067	1,193	4,727
Wilkinson	165	74	863	1,002	3,510

Source: U.S. Environmental Protection Agency, 1977.
Notes: *Highest recorded.

Table 20
Estimated Air Pollution Emissions for Selected Alabama Counties

County	Particulate	SOx	NOx	HC	CO
			Emissions (tons/yr)		
Mobile	*11,870	*10,366	*18,860	*33,911	*140,107
Baldwin	1,454	1,183	5,287	12,336	43,388

Source: U.S. Environmental Protection Agency, October 1977
Notes: *Highest Recorded.

practical treatment or secondary treatment to achieve standards. The effluent limited segment is and will continue to meet water quality standards by the "best practicable control technology" or secondary treatment for publicly owned facilities.

Some of the types of pollutants that enter the water from non-point sources include soil particles, nutrients, organic matter, microscopic organisms, inorganic matter, heavy metals, chemicals and pesticides. The erosion of soil particles is a major single polution source. The majority of non-point pollution can be attributed to errosion areas, intense agricultural practices and construction in highly populated areas.

Texas, Louisiana and Alabama have extensive data available for each water quality basin and water quality management plans have been prepared in compliance with above mentioned law.

Texas

Neches-Trinity Coastal Basin—This basin has 3 coastal segments, 2 are classified as effluent limited and one as water quality limited.

Trinity-San Jacinto Coastal Basin—This basin has four segments, two are classified as effluent limited and two are water quality limited.

San Jacinto-Brazos Coastal Basin—There are ten segments in this basin, seven of which have water quality problems, the other three are classified as effluent limited.

Brazos-Colorado Coastal Basin—The only coastal segment in this basin is classified as effluent limited.

Colorado-Lavaca Coastal Basin—There are three coastal segments in this basin, two are effluent limited and one is water quality limited.

Lavaca-Guadalupe Coastal Basin—There are nine segments in this basin, eight are classified as effluent limited and one is water quality limited.

Nueces-Rio Grande Coastal Basin—There are five segments in this basin, four are classified as effluent limited and one is classified as water quality limited.

Louisiana

There are six coastal basins in Louisiana. Each basin is discussed and the water quality segments are indicated. Possible causes for non-compliance also are indicated.

Calcasieu Basin—The basin contains one large major urban area (Lake Charles) and the majority of the area is rural. The southern most parish (Cameron) which is on the Gulf Coast is mostly marshland.

There are 13 sub-basins, six are classified as water quality limited and seven are classified as effluent limited. Dissolved oxygen, fecal coliform and oil and grease are the major factors that result in the water quality classification. They result from industrial discharge, untreated sewage and run-off from oil and gas operations.

Mermentau-Vermilion-Teche Basin—There are 17 sub-basins within this basin, three of which are classified as water quality limited and 15 are classified as effluent limited.

Dissolved oxygen and fecal coliform parameters exceeded the individual water quality criteria. The excessive fecal coliform organisms were from non-point sources, primarily, non-sewered surburban areas. New sewer systems are being proposed for this area to alleviate the problem.

Atchafalaya River Basin—This basin is comprised mainly of undeveloped woodland, swamp and marsh. There are six subbasins, all of which are classified as effluent limited.

Barataria Bay Basin—There are four segments in this basin, all of which are effluent limited.

Lower Mississippi River Basin—There are five segments in this basin, three are classified as effluent limited and two are classified as water quality limited.

The problem in these segments are taste and odor that is caused by industrial dischargers. Waterborne commerce activities could be a significant source of water quality problems.

Terrebonne Basin—This basin is predominantly undeveloped marsh and swamp, with some oil and gas fields, and wildlife management areas. Along the coast there is significant industrial area attributed oil and gas development and production.

There are eight segments in the basin, seven are classified as effluent limited and one is classified as water quality limited.

The water quality limited segment is considered a shellfish propogation area. It has dissolved oxygen and coliform violations.

Alabama

Mobile River Basin—The Mobile River basin has a major urban area that is oriented toward trade, transportation and manufacturing.

There are substantial water quality problems throughout the Mobile River Basin. The most persistently occurring violations are for dissolved oxygen and coliform bacteria. Pesticides and heavy metals (mercury) have also been recorded in Mobile Bay. Water quality degradation is attributed to domestic waste. The tremendous increase in population from tourism in the summer months places a heavy burden on the waste treatment facilities. Industrial sources account for 95 percent of the total waste discharges measured on oxygen demand. Major contributing industries are paper and pulp, oil production, and the chemical industry.

Perdido-Escambia River Basin—Water quality in this basin is generally degraded. Although some problems are caused by natural swamp and forest drainage, agricultural, urban and industrial areas contribute a large portion of the deleterious substances.

3. Other Socioeconomic Factors

The industrial and economic effects that may result from this sale are difficult to delineate, due to the wide geographic dispersion of the tracts and the fact that the Gulf of Mexico area is a major supplier of crude oil, petroleum products, and natural gas to other regions of the United States. The following discussion is limited to the onshore areas adjacent to the lease sale region since the initial economic effects may be assumed to impinge on these sectors.

The economic activity that has occurred in the areas bordering the Gulf of Mexico has been a significant part of the total economic activity of the nation.

The states bordering the Gulf of Mexico include Texas, Louisiana, Mississippi, Alabama, and Florida. For the purpose of this discussion, the coastal area of Texas can be considered to be the western Gulf of Mexico region, the coastal portion of Louisiana can be considered to be the central Gulf of Mexico region, and the coastal portions of Mississippi, Alabama, and the western part of the coastal region of Florida can be considered to be the eastern Gulf of Mexico.

The historical changes that have occurred within the economies of the states bordering the Gulf of Mexico are summarized in the following paragraphs. These descriptions were based on statistical data by the Research Department of the Federal Reserve Bank of Atlanta (1976) supplemented by additional information relating to current economic conditions.

An article by Faulkinberry (1977) recently discussed shifting population trends within various regions of the United States. The author notes that the population factor is perhaps the basic ingredient of any economy since changes in demographic patterns have a far-reaching impact on the social and economic characteristics of a region including culture, composition, geographic dispersion, income levels, wealth, occupations, and economic demands of its people. Changes in an area's population occur through natural increases (births minus deaths) and net migration.

The South, defined as a 16 state area extending from the District of Columbia to Texas, accounted for more than half of the nation's population growth in 1970–75 compared to less than one-third in the 1965–70 period.

One of the reasons for this change has been the increase in migration to the South. The principal immigration has been from the Northeast and North Central regions. Out-migration has been to the West and North Central regions.

The explanation for this change in population may be due to the many factors. Aggregate migration may be a response to higher income levels, but the country's largest interregional migration flows have been into the South, the region where per capita income is lowest. Some consideration should be given to cost-of-living differences, and it may be that lower price levels in the South may compensate for lower per capita income levels. Expectations of future income may be a factor and, if so, the changes in per capita income may be the significant factor.

The best single explanation of the acceleration of migration to the South was considered to be the effect of lower prices and wages, abundant labor, and available natural resources. Possible effects of the easily accessible energy sources in the southern petroleum states, and the milder climate offered energy savings to all kinds of businesses.

In the six state area of Alabama, Florida, Georgia, Louisiana, Mississippi, and Tennessee, the population growth rate during 1970–75 amounted to 11 percent, and for individual states ranged from 4.25 percent in Louisiana to 23.64 percent in Florida. The growth rate in this group of states was more than twice the growth rate in the South as a whole.

Some pertinent measures of economic activity in the southeastern States are presented in the following paragraphs.

A recent article (Fergus, 1977) reviews the energy requirements, particularly of oil and gas of various sectors of the economies within selected states. The procedure utilized a determination of major U.S. industries which are heavy energy users, and then noted the relative importance of these industries in the southeastern states, and sketched the implications of this relationship for the southeastern states (table 21). This chart shows relatively high reliance on petroleum and natural gas in the non-fuel mining, non-durable goods manufacturing, and agricultural industries.

Compared to the total United States economy, employment shares in both agriculture and non-durable goods manufactured in the southeastern region are higher, indicating a greater regional dependence on these industries, indicating that this region may be subject to a greater degree to energy-induced cost increases. The implications of this relationship vary from state to state, depending on the composition of the economy.

A. POPULATION

Between the years 1965 and 1975, the population of the United States increased from 193,526,000 to 213,121,000 persons, an increase of 19,595,000 persons, approximately 10.1 percent of the 1965 population. Table 22 presents these changes for the affected States.

Additional data, provided from the OBERS projections, applicable to the coastal areas are provided on the following tables. OBERS refers to the output of a program conducted by the Bureau of Economic Analysis, U.S. Dept. of Commerce, and the Economic Research Service of the U.S. Dept. of Agriculture for the Water Resources Council. The program provides an integrated set of projections. Population of the 5 states as estimates for the year 1980 are shown on table 22. By 1975, three of the states exceeded the 1980 level projected by OBERS.

The coastal portion of Louisiana and part of Mississippi, comprising the central Gulf of Mexico region, is included with Bureau of Economic Analysis (BEA) economic areas 138 and 139.

The coastal portions of Alabama, a portion of Mississippi coastal area, and the major portion of the western coastal area of Florida are included in BEA economic areas 037, 038, 039 and 137. This area is referred to as the eastern Gulf of Mexico region.

The coastal portions of Texas are included within BEA areas 140, 141, 142, 143, and 144, and are included within the western Gulf of Mexico region.

A comparison of the population, employment, and personal income of the inhabitants of these regions with the total United States population, employment, and personal income is shown in table 23.

Perhaps the most significant relationship revealed in table 23 is that all three regions' employment and personal income is a smaller percentage of national employment and personal income than is the percentage of population of the total U.S. population.

The BEA economic regions included within the classification of western, central, and eastern Gulf of Mexico form only a portion of the various states bordering the Gulf of Mexico.

B. HOUSING

The existing housing situation in coastal Texas and Louisiana is summarized in table 24. Most of the coastal counties seem to be growing in population and are projected to continue growing in this century. Some of this growth may be caused by the shift from onshore to offshore oil production.

Another large component of growth comes from the growing industrialization of the south as industries relocate to take advantage of the Gulf states economic atmosphere. Any growth in number of employees that is not taken from the ranks of the local unemployed will result in a population increase and a consequent increase in housing requirements. The more rapid the expansion, the more short term housing shortages will result.

C. EMPLOYMENT AND INCOME

(1) *Alabama*

Selected portions of the economic activity for Alabama are presented in table 25.

During 1970, approximately 29 percent of the civilian employment in Alabama was in the manufacturing category. Approximately half of the employment in manufacturing was in the production of durable goods, particularly in the metal industries. The largest percentage of employment in the manufacturing of nondurable goods was in the category of textiles and textile products.

A recent review of the economy of Alabama by Gunther (1975) stated: "Certainly a strong note

Table 21
Energy Requirements for Selected Industries

Industry	Input cost in cents per dollar of output Petroleum & Natural Gas	Total Energy
Mining (excluding fuels)	3.3	5.9
Nondurable goods	3.5	4.8
Agriculture	3.6	4.3
Durable goods	2.0	3.9
Transportation and trade	2.5	3.5
Construction	2.1	2.9
Services	1.5	2.4

Source: Fergus, 1977.

Table 22
Population Changes

State	Population (thousands) 1965**	1975**	Projected 1980***	% Change 1965-1975
Alabama	3,443	3,614	3,747	5.0%
Louisiana	3,496	3,791	3,744	8.4%
Mississippi	2,246	2,346	2,328	4.5%
Texas	10,388*	12,237	12,167	17.8%

*Estimated from 1960 and 1970 figures.

Source: **Federal Reserve Bank of Atlanta Research Department, 1976.
***U.S. Departments of Commerce and Agriculture, OBERS Projections.

Table 23
Population and Employment By Income Regions Compared to Total U.S., 1970

		Gulf of Mexico		
	Total U.S.	Western	Central	Eastern
Total Population	203,857,864	4,883,064	2,900,230	3,267,717
% Of U.S.	---	2.4%	1.4%	1.6%
Total Employment	79,306,527	1,816,283	963,028	1,138,419
% of U.S.	---	2.3%	1.2%	1.4%
Total Personal Income 1/	$708,583,931	$15,059,700	$7,973,192	$9,150,233
% of U.S.	---	2.1%	1.1%	1.3%

1/ Total personal income in thousands of 1967 dollars.

Source: USD Commerce and USD Agriculture, 1974.

Table 24
Population and Housing Situation 1970 with Projections to 1980

Selected Coastal Counties

County and State	Population 1970*	Housing Units 1970**	Population 1980*	Housing Units 1980***	% Change in Housing 1970-1980
TEXAS					
Aransas	8,902	3,124	13,600	4,772	53%
Brazoria	108,312	34,694	148,600	52,140	50%
Calhoun	17,831	6,256	21,500	7,544	20%
Chambers	12,187	4,687	15,500	5,439	16%
Galveston	169,812	61,890	184,000	64,561	4%
Harris	1,741,912	587,671	2,240,000	786,210	34%
Jefferson	244,773	85,885	260,300	91,333	6%
Matagorda	27,913	10,964	30,400	11,949	9%
Nueces	237,544	83,348	274,300	96,246	15%
Orange	71,170	24,972	95,200	33,405	34%
San Patricio	47,288	16,592	46,000	16,140	-3%
LOUISIANA					
Calcasieu	145,415	42,065	154,864	54,338	29%
Cameron	8,194	2,310	9,955	3,493	51%
Iberia	57,397	15,613	64,187	22,522	44%
Jefferson	337,568	101,309	555,833	195,029	92.5%
LaFourche	109,716	18,001	84,829	29,765	65%
Orleans	36,511	191,363	614,342	215,559	13%
Plaquemines	25,225	6,533	28,747	10,087	54%
St. Martin	32,453	8,439	36,018	12,638	50%
St. Mary	60,752	10,090	73,953	25,948	61%
Terrebonne	76,049	19,594	74,299	26,070	33%
Vermilion	43,071	12,752	47,707	16,739	31%

Source: *From Poston and Bradshaw, 1972 and Jones and Rice, 1972.

**From Houston-Galveston Area Council, 1972; and University of New Orleans, College of Business Administration, OBER, 1974.

***Using a population to housing ratio of 2.85.

Table 25
Selected Economic Activities for Gulf States

	Alabama*		Louisiana*		Mississippi*		Texas**	
	1965	1975	1965	1975	1965	1975	1965	1975
Per Capita Personal Income	$1,987	$4,557	$2,134	$4,729	$1,684	$4,041	$2,052	$5,631
			- - - Millions of Dollars - - -					
Total Personal Income	6,840	16,469	7,461	17,928	3,783	9,481	20,518	68,903
Total Cash Farm Income	684	1,397	507	1,102	846	1,395	2,575	5,851
Crops (mill. $)	254	545	296	770	485	708	1,352	2,789
Livestock and Products	394	840	189	314	334	667	1,075	3,061
Value of Construction	679	1,845	1,190	1,851	489	1,042	1,132	1,737
			- - - Million of Barrels - - -					
Petroleum Production	8	13	595	655	56	47	943	1,222
				- - - Thousands - - -				
Employment (thousands)								
Manufacturing	277	320	158	182	153	198	497	835
Construction	52	68	77	90	29	36	-	299
Farm	120	91	121	68	179	92	415	255

Source: *Federal Reserve Bank of Atlanta
**Texas Almanac and Industrial Guide

for the future is the presence of vast coal deposits and potential oil reserves in and off the coast of Alabama. The industrial mix of the state should prevent any serious declines in employment in the near future with the expected strengths of the steel, paper, mining, chemical, and petroleum industries serving as a floor on future unemployment in the state. Construction, one of the most severely depressed industries in the state, has probably seen the worst in the current slump and should begin regaining strength this year.''

During 1977, the Alabama unemployment rate is slightly better than the national average. During 1976, the Alabama unemployment rate was 6.8 percent and in May, 1977 it had fallen to 5.5 percent.

Projections for the economy in Alabama in the near future indicate that 1977 could be a record year for investment spending in the state, and that employment opportunities in the manufacturing sector should be quite favorable in coming months.

The total value of construction activity in March, 1977 was greater than March, 1976 by about 100 percent. On a three month average basis, during the first quarter of 1977, construction contracts were 33 percent above the same quarter of 1976.

Alabama (as well as Tennessee) have large shares of nondurable goods manufacturing employment and above average shares of jobs in agriculture. These industries are heavily dependent on petroleum and natural gas inputs, and may be somewhat sensitive to higher prices of oil and gas (Fergus, 1977).

(3) *Louisiana*

Selected portions of the economic activity for Louisiana are presented in table 25. During 1975 approximately 46 percent of the manufacturing employment in Louisiana was in the durable goods industries, and approximately 54 percent of the employment in manufacturing was in the nondurable goods category.

Approximately 10 percent of the manufacturing employment in Louisiana during 1975 occurred in the metal industries, and over 14 percent of the total manufacturing employment was in the category of chemicals and allied products.

Employment in retail trade in Louisiana amounted to approximately 209,000 persons during 1976, and an additional 31,000 were employed in wholesale trade.

Louisiana's economy is similar to Florida's economy in that important sectors of the economy, such as transportation, services, trade, and construction have relatively low direct requirements for petroleum and natural gas. However, portions of these industries are dependent on tourism which could be affected by higher prices for oil and gas (Fergus, 1977).

(4) *Mississippi*

Selected portions of the economic activity for Mississippi are presented in table 25. During August, 1977, approximately 57 percent of the manufacturing employment in the southern half of the state occurred in the manufacture of durable goods. The balance of employment within the category of manufacturing was in the production of nondurable goods, principally the production of fabricated textile products, and food and kindred products.

During the month of August 1977, total nonagricultural wage and salary employment in Mississippi amounted to 762,900 persons, 30,500 more than during August 1976. Unemployment during September 1977, amounted to 55,300, a decrease of 6,100 from August, 1976.

Part of the increase in employment was due to increases in manufacturing, trade and finance, and mining. Employment in construction, services, and transportation-communications-public utilities recorded small decreases.

A possible impact on the future of the Mississippi economy was noted recently in the Economic Review published by the Federal Reserve Bank of Atlanta. Increased energy costs may be expected to have an impact in those economies containing industries dependent on petroleum and natural gas inputs. The agricultural character of Mississippi's economy makes the state vulnerable to cost increases (Fergus, 1977).

(5) *Texas*

Selected indicators of economic activity in Texas are presented in table 25. During 1976, approximately 470,900 workers were employed in the manufacture of durable goods, and approximately 387,600 were employed in manufacturing nondurable goods.

Employment in wholesale and retail trade amounted to approximately 1,165,500 persons in 1976. Employment in water transportation amounted to approximately 20,000, and employment in pipeline transportation amounted to approximately 5,000 during 1976.

The recent changes in the economy of the State of Texas have been summarized by Stockton (1975).

Comparison of business activity in Texas with measures of business activity on the national level indicated that the Texas economy has shown much greater resistance to the depressing forces present within the national economy than has the nation as a whole; however, the Texas economy did not maintain a normal growth rate.

The most depressed segment of the Texas economy has been the building industry. For the first two months of 1975 the amount of building construction authorized declined 29 percent from the same period in 1974; however, much of the construction authorized in earlier periods was still providing jobs and the employment in contract construction was 1.7 percent higher in February 1975 than in February 1974. However, the decline in authorized construction may indicate future unemployment as workers are released when current projects are completed. The number of building permits issued for repairs, additions, and alterations has increased.

Employment in the manufacture of durable goods had declined from approximately 451,000 during February 1974 to about 437,000 during February 1975, and employment in the manufacture of non-durable goods had decreased from 364,000 to 350,000 workers.

The influence of the increased level of petroleum exploration both within the state, and in other areas, was reflected in various sectors of the Texas economy. "Employment in machinery manufacture (excluding electrical) was 8.0 percent higher in February 1975 than in February 1974, reflecting largely the increase of 17.5 percent in employment in oil field machinery manufacture. This is the result of the recent increase in oil exploration. Employment in the manufacture of instruments and related products, which also reflects the effects of oil exploration, increased 5.1 percent over the past year" (Stockton, 1975).

During the first six months of 1977, permits for new construction in Texas amounted to $3.1 billion, 29 percent above the comparable figure for 1976. Residential construction was 48 percent higher than in the 1976 period and amounted to $1.8 billion. Industrial buildings amounted to $1.38 million, 83 percent above the 1976 period (Cannon, 1977).

The increase in domestic oil prices has led to a reevaluation of the oil and gas reserves of Texas. The wellhead price of Texas oil increased from an average of $3.28 per barrel in 1970 to $8.02 per barrel in 1976. Since the state tax on oil and gas production is an ad valorem tax, these higher prices have resulted in additional revenues to the state of Texas. Energy tax revenues rose from $553 million in 1970 to $1,224 million by 1976, amounting to 25.4 percent of the state's entire 1976 revenues.

The effect of the price increases on drilling activity has been substantial. During the year 1973, 8,031 wells were drilled, and during the year 1976, 13,884 wells. Energy industry employment amounted to 45,400 additional jobs (Askari and Creasy, 1977).

Employment within Texas in activities related to the oil and gas production and processing industries has also been affected during recent years as discussed by Stockton (1975): "Currently oil production in February, 1975, decreased 7.0 percent compared with February, 1974, as the Texas fields have apparently reached their full capacity for the present. But higher prices of crude oil can be expected to continue; they will undoubtedly support exploration and will add substantially to the economy. Texas employment in oil and gas extraction in February, 1975, showed an increase of 10.5 percent over the February, 1974, figure, in spite of the fact that the total production of crude oil declined over the same period. The decline in gasoline consumption over the past year is reflected in the 15.1 percent decline of employment in refining. Some of the decline in refining has been offset by increased activity in chemicals, which are mainly petrochemicals. In spite of the decline in refining, oil and gas continue to be among the major supporting factors for the Texas economy."

D. PETROLEUM DEVELOPMENT

Some further discussion of the petroleum industry of the states adjacent to the Gulf of Mexico is appropriate since crude petroleum and natural gas production developed as a result of exploration and production activity on the Outer Continental Shelf will probably be a source of raw material for initial processing within the coastal portions of these states.

The production of oil and gas may be classified as a primary industry; the further processing of oil and gas in refineries, natural gasoline plants, and petrochemical plants may be considered as secondary industries; and the increased development of tertiary industries may be expected to develop as a result of the economic activity undertaken by the primary and secondary industries.

The coastal region of the states bordering the Gulf, including both onshore and offshore areas, have been productive of oil and gas for many years. The production of these hydrocarbons has led to the extensive development of a system of production, transportation, refining, and other manufacturing facilities based on the availability of crude and refined petroleum products in the region.

Oil and gas resources include substances classified as crude oil, condensate, natural gas, and natural gas liquids. Crude oil is a mixture of hydrocarbons that exists as a liquid in the natural underground reservoir and continues to exist as a liquid on the surface at atmospheric pressure. Condensate is a substance that exists as a gas in the natural underground reservoir and exists as a liquid under atmospheric conditions. Natural gas plant liquids are hydrocarbons extracted from streams of natural gas processed at plants. The American Petroleum Institute and American Gas Association statistical data include as crude oil small amounts of hydrocarbons recovered from oil well gas that exist as gases in the reservoir but become liquid at atmospheric pressure. All other liquids, including condensate, are reported as natural gas liquids.

(A) HISTORICAL DATA OF GULF OF MEXICO OCS OPERATIONS

Table 26 presents new well and completion activity on the Federal domain in the Gulf of Mexico. The number of acres held under active lease in the Gulf of Mexico has increased from 3.9 million acres in 1969 to 7.8 million acres as of March 23, 1977. Approximately 42 percent of this acreage was classified as included in producing leases, compared to 58 percent so classified in 1968.

The amounts of oil, condensate, and gas that have been produced from Federal leases in the Gulf of Mexico are published in Outer Continental Shelf Statistics, U.S.G.S., June 1975.

The amounts of oil and gas produced from these leases is tabulated on table 27.

The term "offshore" describes marine drilling and production activities on state, as well as Federal leases (table 28).

Offshore gas well footage drilled during recent years is summarized on table 29. During 1976, the most important region for development drilling of gas wells was offshore Louisiana, but exploratory drilling for gas in the offshore Texas area increased in 1976, compared to the year 1975, and exploration footage for gas off Texas has been higher than the gas exploration footage assigned for Louisiana during the past five years.

Crude petroleum production

During the year 1975, approximately 65 percent of the total U.S. production of crude petroleum occurred in the states of Alabama, Florida, Louisiana, Mississippi, and Texas.

The quantities produced in the coastal area of Louisiana and Texas, as well as the total production from Alabama, Florida, and Mississippi, are shown in in table 30.

A significant fact revealed by these statistics is a decline in the production of crude oil and condensate in this region. Production of crude petroleum in three of the five areas in this region decreased between 1972 and 1975, reflecting the national trend. The increases recorded in the other two were not sufficient to offset the decline in the region.

Natural gas

The Minerals Yearbook (U.S. Department of the Interior, 1973) and other publications of the Department provides statistical detail concerning the source and use of natural gas.

Natural gas produced in the Gulf region was used to satisfy the demand for gas by individuals and organizations within the region and in other areas of the United States. During the year 1975, natural gas was also imported from Canada and Algeria. Some volumes of natural gas produced in other states were transported into the region during the year. Additionally, the Federal Energy Regulatory Commission has aproved the construction of an LNG import terminal at Lake Charles, Louisiana that is expected to begin importing LNG from Algeria in 1980. The facility's average gas send-out rate will be approximately 425 million cubic feet per day.

Approximately 96 percent of the natural gas withdrawn from the wells was marketed. The balance was used for repressuring and a small amount was vented to the atmosphere or flared. The marketed production of natural gas, augmented by volumes obtained from other areas,

Table 26
OCS Drilling Activity in the Gulf of Mexico

Year	New Wells	Well Operations	Well Completions Producible Oil and Gas Zones		
			Oil	Gas	Total
1968	931	410	524	166	690
1969	826	363	448	125	573
1970	827	535	611	266	877
1971	806	379	357	240	597
1972	839	335	303	180	483
1973	816	418	302	288	590
1974	808	305	221	155	376
1975	863	390	218	277	495
1976	1023	427	259	258	517

Table 27
Oil and Condensate
(MB)

Year	Louisiana	Texas	Total
1968	263,825	3,111	266,936
1969	300,159	2,760	302,919
1970	333,411	2,247	335,658
1971	385,760	1,685	387,445
1972	387,591	1,733	389,324
1973	374,197	1,618	375,815
1974	342,435	1,382	343,817
1975	313,593	1,340	314,933
1976	301,887	1,054	302,941

Natural Gas
(MMCF)

1968	1,413,468	109,911	1,523,379
1969	1,822,468	127,097	1,949,641
1970	2,273,147	133,300	2,406,447
1971	2,634,014	127,358	2,761,372
1972	2,881,365	147,156	3,028,521
1973	3,055,628	148,674	3,204,302
1974	3,349,171	159,979	3,509,150
1975	3,332,169	122,573	3,454,742
1976	3,499,866	92,582	3,592,448

Source: U.S. Geological Survey, 1977.

Notes: (MB) one thousand barrels
(MMCF) one hundred thousand cubic feet

Table 28
Offshore Exploratory Gas Well Footage
(M ft)

	1972	1973	1974	1975	1976
Texas	77.7	150.9	89.8	70.5	83.1
Louisiana	60.6	18.2	16.2	94.9	29.6

Offshore Developmental Gas Well Footage
(M ft)

	1972	1973	1974	1975	1976
Texas	51	34	77	42	41
Louisiana	1,467	2,314	1,552	1,771	2,123

Table 29
Crude Oil and Condensate Production for Texas and Louisiana Offshore Areas

	1972 (MB)	1976 (MB)
Louisiana		
State	58,327	39,978
Federal	387,594	316,480
Total	445,921	346,076
Texas		
State	740	353
Federal	1,733	426
Total	2,473	779
Gulf of Mexico		
State	59,067	40,311
Federal	389,327	316,906
Total	448,394	357,217

Source: U.S. Bureau of Mines, 1977.

Notes: (MB) one thousand barrels

Table 30
Crude Petroleum Production

	1973	1975
Alabama		
Crude Petroleum Production*	11,677	13,477
Producing Oil Wells	586	608
Average Production**	56.6	62.1
Average Value Per Barrel	$3.58	$10.13
Louisiana (Gulf Coast area only)		
Crude Petroleum Production	791,760	613,502
Producing Oil Wells	13,086	12,535
Average Production	162.4	132.4
Average Value Per Barrel	$4.00	$7.10
Mississippi		
Crude Petroleum Production	56,102	46,614
Producing Oil Wells	2,901	2,237
Average Production	50.4	56.9
Average Value Per Barrel	$3.81	$6.66
Texas (Gulf Coast area only)		
Crude Petroleum Production	253,296	234,365
Producing Oil Wells	14,199	14,108
Average Production	46.6	45.3
Average Value Per Barrel	$4.11	$7.96
United States (Total)		
Crude Petroleum Production	3,360,903	3,056,779
Producing Oil Wells	497,378	500,333
Average Production	18.3	16.8
Average Value Per Barrel	$3.89	$7.56

Source: U.S. Bureau of Mines, 1977.

Notes: *Thousands of barrels
**Average production per well per day (barrel)

was delivered to interstate pipelines for transmission to other areas, consumed in the region, or added to storage. Some amounts of gas were lost in transmission.

Some of this gas was used for lease and plant fuel and pipeline fuel, but approximately 73 percent was delivered to consumers, including residential and commercial users, electric utilities, and industrial establishments. The industrial uses of the natural gas included fuel for refining operations, feedstock for the chemical industry, and as material for the manufacture of carbon black.

(B) PETROLEUM REFINING AND PETROCHEMICALS IN THE *COASTAL ZONE*

On January 1, 1974, the crude oil capacity of the operating petroleum refineries in the United States amounted to 14,220,316 barrels per calendar day. An additional 232,800 BCD of refining capacity was located in Puerto Rico and the combined crude oil capacity in these operating refineries amounted to 14,453,116 barrels per calendar day. The total operating refinery capacity in the refining districts along the coast of the Gulf of Mexico by June 1, 1977 amounted to 6,010,023 BCD or approximately thirty-six percent of the total U.S. capacity (table 31).

Additional crude oil refining capacity amounting to 346,900 barrels per day was under construction in the coastal area of the Gulf of Mexico. This capacity amounts to approximately twenty-eight percent of the capacity under construction in the United States (table 32).

Petroleum refining industry of Texas, Louisiana, Mississippi, and Alabama

The raw material received at refineries in the Texas Gulf coast refining district includes crude oil from domestic and foreign sources, natural gas liquids and other hydrocarbons. The products produced by refineries include gasoline and other fuels, lubricating oils, wax, coke, asphalt, and feedstock for petrochemical plants.

Refineries in Texas receive crude oil from other states for processing, and some of the crude oil produced in Texas is shipped to other states for refining.

Petrochemical industry of Texas

Chemical production is Texas' top-ranking industry as measured by value added by manufacture (the difference between the cost of raw materials and the value of products). In 1976, more than 63,000 workers were employed in chemical plants. The output value in 1976 totalled $14.6 billion. The most important group is industrial organic chemicals, the basic materials from which synthetic fibers and plastics, rubber, and lubricants, and hundreds of other products are made (USDC, 1976).

By volume, the Texas Gulf coast has the greatest United States concentration of chemical plants, producing more than forty percent of every basic petrochemical, eighty percent of the synthetic rubber, and sixty percent of the nation's sulfur. By conservative estimates, the total production of petrochemicals in Texas in 1971 was between 75 and 85 billion pounds. Ethylene is produced in greatest quantity, with propylene and benzene next.

The most important reason cited for the growth of the petrochemical industry in Texas is nearness to raw materials. Other factors influencing the development of this industry have included the availability of an existing facility; the availability of transportation, labor and land; and nearness to markets.

Petroleum-related industries in Louisiana

The following description of some of the important industries in Louisiana was published in the Statistical Abstract of Louisiana (1977).

More than $222 million was invested in the chemical industry. There are approximately 100 major petroleum and petrochemical plants in Louisiana making the state one of the principal producers in the United States. A number of the facilities are among the largest of their kind in the world.

In 1977 Worldwide Petrochemical Directory, published by The Petroleum Publishing Company, contains a listing of petrochemical facilities under construction. Of the 45 plants under construction in the states adjacent to the Gulf of Mexico, 29 were proposed for Texas, 13 for Louisiana, 2 for Alabama, and 1 for Mississippi.

During 1975, refineries in the Gulf Coast region received crude oil from producing wells in the same state as the refinery location, from producing wells in other states, and imported crude oil from foreign nations (table 33).

The Federal Energy Regulatory Commission recently provided an analysis of the outlook for domestic natural gas supply and demand.

Domestic natural gas production has decreased over the past three years with little prospect for

Table 31
Petroleum Refineries - Gulf of Mexico Region

Operator	Location	Crude Capacity (BPD)
Texas Gulf Coast		
American Petrofina	Port Arthur	110,000
Amoco Oil	Texas City	348,000
Atlantic Richfield	Houston	306,000
Champlin Refining	Corpus Christi	125,000
Charter International	Houston	70,000
Coastal States Petrochemical	Corpus Christi	185,000
Crown Central Petroleum	Pasadena	100,000
Eddy Refining	Houston	3,088
Exxon	Baytown	390,000
Gulf	Port Arthur	312,100
Marathon	Texas City	66,000
Mid Texas	Hearne	3,000
Mobil	Beaumont	335,000
Monsanto	Alvin	8,500
Phillips	Sweeny	104,000
Quintana Howell (Joint Venture)	Corpus Christi	44,559
Saber Refining	Corpus Christi	9,950
Shell	Deer Park	294,000
South Hampton	Silsbee	18,100
Southwestern Refining	Corpus Christi	120,000
Sun	Corpus Christi	57,000
Texaco	Port Arthur	406,000
Texaco	Port Neches	47,000
Texas City Refining	Texas City	74,500
Union Oil of California	Nederland	120,000
Independent Refining Corp.	Winnie	13,490
Louisiana Gulf Coast*		
Alabama		
Marion Corp.	Theodore	19,200
Louisiana Land & Exploration	Mobile	39,636
Louisiana		
Canal Refining	Church Point	4,800
Cities Service	Lake Charles	268,000
Continental Oil	Egan	15,000
Continental Oil	Westlake	83,000

Table 31 (cont'd)

Operator	Location	Crude Capacity (BPD)
Louisiana (cont'd)		
Evangeline Refining	Jennings	5,000
Exxon	Baton Rouge	510,000
Good Hope Refineries	Good Hope	70,000
Gulf Oil	Belle Chasse	195,900
Gulf Oil	Venice	28,700
Hill Petroleum	Krotz Springs	5,000
La Jet	St. James	15,000
Marathon	Garyville	200,000
Murphy Oil	Meraux	92,500
Placid	Port Allen	36,000
Shell	Norco	240,000
Tenneco	Chalmette	86,000
Texaco	Cenvent	140,000
Mississippi		
Chevron U.S.A.	Pascagoula	280,000
Total		6,010,023

Source: U.S. Bureau of Mines, 1977

Notes: *Refining Districts; BPD - barrels per day

Table 32
Petroleum Refineries Under Construction

Operator	Location	Crude Capacity (BPD)
Texas Gulf Coast*		
Texas City Refining	Texas City	46,000
Tipperary Corp.	Ingleside	5,000
Exxon	Baytown	250,000
Louisiana Gulf Coast*		
Alabama		
Marion Corp.	Theodore	1,900
Louisiana		
La Jet, Inc.	St. James	15,000
Tenneco Oil Co.	Chalmette	29,000
Total		346,900

Source: U.S. Bureau of Mines, 1977.

Notes: *Refining district; BPD - barrels per day

Table 33
Crude Oil Transportation, 1975

Area	Pipelines (MB)	Tank Cars & Trucks (MB)	Tankers & Barges (MB)
Alabama			
Domestic crude	10,835	741	1,120
Foreign crude	---	---	671
Louisiana			
Domestic crude	368,189	6,451	88,281
Foreign crude	---	---	89,159
Mississippi			
Domestic crude	58,143	1,746	---
Foreign crude	---	---	38,600
Texas			
Domestic crude	807,292	15,285	81,235
Foreign crude	5,258	---	303,361
Totals	1,249,717	24,223	602,427

Source: USDI, BOM, 1977.

Notes: (MB) one thousand barrels

reversal of this trend. Additions to reserves during the past decade have been less that one-half of the amount necessary to maintain a constant level of proven reserves. However, demand for gas continues to expand, as evidenced by pipeline curtailments and the construction of LNG facilities and tankers.

At current prices, demand outstrips supply by at least 7 to 8 trillion cubic feet per year, based on curtailments of gas service of 3.8 trillion cubic feet per year, and an estimate of the amount of gas that would be required by new customers if gas pipelines were able to accept them.

Projections of annual production incorporating various assumptions of production that may be obtained from new onshore and offshore sources indicate that by the year 1985 domestic production will have declined by 20 percent. Supply shortfalls will have to be covered by new domestic supplies of gas, by impacts, or by alternate fuels.

Any gas reserves discovered in the Gulf of Mexico will find a ready market, and considering the extensive pipeline network, transpoortation of any gas discovered as a result of this lease sale should not be a problem (Williams, 1977).

e. LOCAL, STATE AND FEDERAL GOVERNMENT PLANS, POLICIES AND RESTRICTIONS

(1) *Local*

Municipalities and, except in Texas, and Alabama, counties in the Gulf coast area have been granted broad powers by their respective states to control human activities within their geographical jurisdictions. In exercising this authority, local governments have typically enacted various programs and ordinances often including comprehensive land use plans, zoning ordinances, subdivision regulations, flood plain management ordinances, building codes, noise standards, air quality emission regulations, health regulations, performance standards for industrial operations, and the siting of utility lines including pipelines, and public review and approval requirements prior to the initiation of specific activities.

Local capital and operating budget processes and procedures may also function as de facto land use controls by influencing the location and scheduling of road and sewer construction, the availability of public water supplies and other infrastructural elements.

Federal OCS activities per se occur in federal waters and therefore, outside of local areas of jurisdiction. However, secondary activities resulting from OCS leasing, activities such as the location and operation of service bases, pipelines, terminals, processing plants, and other facilities are subject to local laws and regulations. Industrial siting location is often significantly influenced by local government policies and restrictions such as zoning regulations, local taxation, educational policies, and other governmental attitudes of an economic nature or those affecting the ''quality of life'' of company employees and their families.

(2) *State*

The four states within the proposed sale area have formulated numerous plans, policies or restrictions which may relate either directly or indirectly to federal OCS leasing and related activities. States programs may include Coastal Zone Management programs and statutes governing shoreline uses; 208 Water Quality Management Plans; highway programs; oil and gas transmission regulations; flood plain management; air and water quality standards; tax inducements to attract labor intensive industries; fisheries management and propogation programs; regulations governing common carriers; waste disposal regulations; and, plans and regulations for the protection of natural resources. Texas, Louisiana, and Alabama also have plans for the development of deep water offshore oil ports. Planning for the proposed deepwater offshore oil port off of Alabama; however, has been inactive since late 1975.

(3) *Federal*

Federal plans, policies and restrictions include programs and regulations relative to drilling and production activities, offshore structures, pipeline construction and safety, air and water pollution and emissions and discharges, the transfer of oil from vessel to vessel and between onshore and offshore facilities and vessels, protection of marine mammals and endangered species.

Additionally, there are various federal programs providing technical and financial assistance to states and local governments. These programs principally involve planning and construction activities and land acquisitions.

D. Future Environment Without This Proposal

The addition of any oil and gas produced as a result of this proposed sale to the quantities of oil and gas currently being produced on the Outer Continental Shelf in the Gulf of Mexico can be expected to continue the use of facilities installed for the transportation and processing of oil and gas reserves developed from previous state and federal offshore lease sales.

Production developed in onshore areas prior to, concurrent with, and subsequent to production developed in the offshore areas also requires production, transportation and processing facilities. In the event that this proposed sale was not held, it is considered probable that the skilled and unskilled labor, specialized equipment, and other facilities that would be employed in the development of leases awarded as a result of this proposed sale would be employed in the specialized activity of exploring for, producing, processing, and transporting oil and gas in an alternate area.

The resultant economic and environmental impact for these activities in other areas cannot be known at this time, as it would be necessary to delineate these areas in a precise fashion in order to estimate the extent of these impacts. It is possible that the resources would be employed in the onshore areas of the states adjacent to the offshore areas; in which case, the economic impact would be similar to the impact anticipated to result from this proposed sale.

Given the extensive development of industries supporting the offshore production of oil and gas, and the extensive development of industries related to the processing of oil and gas, additional supplies of oil and gas from any source in the Gulf of Mexico area are likely to be processed within existing facilities in the area.

It is probable that industry interest in the OCS indicates that larger quantities of oil and gas may be obtained for a given investment dollar. If this speculation is valid, it suggests that Outer Continental Shelf production is efficient in the economic sense, in that a large return can be anticipated from a small expenditure of scarce resources.

A further observation governing the continued operation of the refining industry, and industries utilizing the products of refineries may be in order. It is probable that existing refineries within the Gulf of Mexico coastal area will continue to operate as long as demand for the products continue. In the event that sufficient feed stock is not available, imported crude oils will be utilized.

The environmental effects of additional onshore production, and/or additional crude oil imports to the existing refining centers, must be considered in determining the status of the future environment of the Gulf of Mexico region in the event that this proposed lease sale is not implemented.

Section III

Environmental Impacts Of The Proposed Action

A. Basic Assumptions Utilized in the Analysis

1. Offshore Oil and Gas Operations

a. CUTTINGS AND DRILLING FLUIDS

Exploratory drilling operations are basically the same regardless of mobile rig type (jack-up drilling rigs, drillships, and semi-submersibles). Initially, a drive casing is installed along with a blowout preventer. The casing is either drilled or jetted into place or driven into the bottom with a pile driver. Drill mud is circulated through the drill stem and casing to contain subsurface pressures and remove rock cuttings. Cuttings are screened and discharged overboard where they settle to the bottom. Some mud remains attached to the cuttings when they are discharged. As the cuttings cascade down through the water column, the mud is washed free and creates a turbid plume trailing with the prevailing surface current. The volume of drilling cuttings generated and drilling muds is listed in table 34. Some operators may reuse the drilling muds during development drilling and have on occasion used it at nearby locations.

Otteman (1976) has considered the problem of drill cuttings and muds which result from offshore drilling and has presented the following analysis which is based upon the experience of one company in the Gulf of Mexico.

"The first 150 feet will be drilled or jetted with seawater. The resulting seawater mud will be returned directly to the sea floor without being pumped to the rig. While drilling the hole to 1,000 feet, typically only seawater will be used as drilling fluid; and it will be discharged overboard. When the formation clays do not make a viscous enough mud, some natural bentonitic clay will be added to the system. The discharged water amounts to approximately 7,000 barrels (for a typical 10,000 ft. well), and it will contain mostly natural mud generated while drilling the hole. Before running the conductor pipe to 1,000 ft., approximately six tons of bentonite clay will be added to the 1,000-barrel saltwater system. When the conductor pipe is cemented, this volume of bentonite clay in seawater will be discharged overboard.

"While drilling the remainder of the hole, the mud is continuously cycled back through the mud system. Some mud is discharged with the drill cuttings; and periodically drilling mud is discharged overboard to make room for natural mud made while drilling the hole. The maximum discharge will not exceed 200 barrels a day while drilling to 5,000 feet and 50 barrels a day from 5,000 to 10,000 feet. During approximately 20 days of drilling to 10,000 feet, some 2,000 barrels of bentonite clay and lignosulfonate treated mud would be discharged overboard. We would possibly begin converting the mud system from a seawater gel mud to a lignosulfonate treated freshwater mud at around 6,000 feet. This decision would be based on the relative economics of hauling freshwater from shore versus the higher maintenance cost of saltwater muds. During the additional 70 days operations while drilling from 10,000 to 18,000 feet, the discharge rate will not exceed 50 barrels a day; approximately 4,000 barrels of lignosulfonate drilling mud would be dumped overboard. When the well is completed, the mud remaining in the surface system is discharged overboard; and this can amount to as much as 800 barrels."

The typical composition of gelled seawater and lignosulfonate treated muds are listed in table 35.

It should be noted that OCS Order No. 7 prohibits the discharge of muds and cuttings which contain any free oil.

b. FORMATION WATERS

Produced water or liquid associated with the extracted oil and gas must be removed and disposed of. Produced water is relict sea water but with anomalous ion ratios. The median concentrations of trace metals found in produced formation waters are listed in table 36.

The following discussion of produced water is taken largely from Koons, et al. (1975).

Produced waters generally contain appreciable concentrations of dissolved inorganic salts in which the principal cations are sodium, magnesium, and calcium. The principal anions are chloride, sulfate, carbonate, and bicarbonate. The concentrations of total dissolved constituents can vary over a wide range such as from a few milligrams per liter to as much as 350,000 mg/liter. Collins (1974, 1975) reviewed the composition of many oil field waters and found that the majority contained high chloride concentrations. Hydrocarbons and some organic compounds may be present in produced waters at part per million levels. Dissolved oxygen may be present at low concentration in produced waters.

Table 34

Drill Cuttings and Muds

Well Type	Hole Size Inches 10,000 ft	Hole Size Inches 18,000 ft	Cutting Volume YD3 10,000 ft	Cutting Volume YD3 18,000 ft	Weight of Cuttings Removed from Hole Tons 10,000 ft	Weight of Cuttings Removed from Hole Tons 18,000 ft	Total Mud Volume (Incl. Hole Volume) bbls. 10,000 ft	Total Mud Volume (Incl. Hole Volume) bbls. 18,000 ft	Drilling Mud Type
Interval Below Mudline (ft)									
0-150	36	36	39	39	72	72	As required		Seawater and natural mud
150-1,000	25	32	108	176	203	332	As required		Seawater-gel natural mud
1,000-4,500	18	20	229	283	448	534	1800	2200	Seawater-gel Lightly treate mud
4,500-10,000	11	-	135	-	272	-	1600	-	Seawater/freshwater - lignosulfonate mud
4,500-12,000	-	15	-	342	-	690	-	2800	Seawater/freshwater - lignosulfonate mud
12,000-18,000	-	10	-	121	-	262	-	2000	Freshwater lignosulfonate mud
		Total	511 YD3	961 YD3	995 Tons	1890 Tons			

Source: Otteman, 1976.

Table 35
Typical Mud Composition - Seawater Gel Mud

This type mud is typically used to drill from the base of the conductor casing to the surface casing point. Generally, the seawater gel system will be used from less than 1000 feet to a maximum of 4500 feet. The components used to make up and maintain the required characteristics of this mud system are:

Mud Components	Lbs/Bbl of Mud
1. Drilled Solids	48-60
2. Bentonitic Clay	30-40
3. Caustic - Sodium Hydroxide	0.5-1.5
4. Mica Flakes (Lost Circulation Material)	0.0- .5
5. Cellulose Polymer	0.0-.25
6. Seawater	As required - approx. 10#/bbl salt from the seawater

Lightly Treated Lignosulfonate Seawater/Freshwater (6,000-8,000 ppm Cl^-) Mud

As the hole is deepened below surface casing it becomes necessary to start adding additional materials to maintain the desired mud characteristics. Slowly fresh water is substituted for sea water as the depth and temperature increase. A typical 10.0-10.5 pound per gallow lightly treated lignosulfonate system used to about 10,000 feet would include:

Mud Components	Lbs/Bbl of Mud
1. Drilled Solids	55-70
2. Bentonitic Clay	20-30
3. Barium Sulfate - Weight Material	45-60
4. Caustic - Sodium Hydroxide	1.0-2.0
5. Lignosulfonate	4-6
6. Lignite	0.0-3.0
7. Cellulose Polymer	0.0-.25
8. Seawater/Freshwater	As required - approx. 5# bbl salt from 50/50 seawater-freshwater

Lignosulfonate Freshwater (3,000-4,000 ppm Cl^-) Mud

The deep portion of a typical well (below approximately 10,000 ft) would require a freshwater lignosulfonate mud system in order to maintain the mud properties as desired for propoer hole maintenance. A typical 10.0-11.0 pound per gallon lignosulfonate treated mud system would include:

Mud Components	Lbs/Bbl of Mud
1. Drilled Solids	65-80
2. Bentonitic	20-30
3. Barium Sulfate - Weight Material	55-150
4. CAustic Sodium Hydroxide	1-2
5. Lignosulfonate	4-8
6. Lignite	3-8
7. Defoamer/Detergents	0.5
8. Fresh water	As required

Source: Otteman, 1976.

Table 36
Chemical Content of Louisiana Offshore Brines

Element		High		Average		Low	
		mg/l	%	mg/l	%	mg/l	%
Iron	Fe	153	0.057	15	0.011	139	0.226
Calcium	Ca	17,000	6.287	4,675	3.294	772	1.254
Magnesium	Mg	2,090	0.773	1,030	0.726	152	0.247
Sodium	Na	84,500	31.250	49,120	34.612	22,651	36.800
Bicarbonate	HCO_3	37	0.014	100	0.070	933	1.516
Sulfate	$SO_4^{=}$	120	0.044	0	0	188	0.305
Chloride	Cl^-	166,500	61,575	86,975	61.287	36,717	59.652
Total Solids		270,400	100%	141,915	100%	61,552	100%

Source: U.S. Geological Survey, 1975a.

Typical sodium concentrations range from 23,000 to 57,000 mg per liter. Typical calcium concentrations are between 2,500 to 25,800 mg per liter and those for magnesium are from 100 to 5,000 mg per liter. There are occasional waters in which values either much higher or lower than the averages are observed.

It is important to note that the metal ions present in highest concentrations are those which are common either to seawater or many terrestial deposits and are not considered hazardous at the low concentrations observed except very close to the discharge. Those metals generally considered as toxic are present at very low concentrations, often below the level of detection of even the sensitive methods used. The metals which would be of greatest concern in the environment are those which are toxic in concentrations of parts per million or less. To consider any possible hazards in discharging produced waters containing toxic metals into the marine environment, it is necessary to consider the following three factors:

(1) Concentration of trace metals in produced waters
(2) Concentration of trace metals in normal seawater
(3) Toxicity levels of toxic metals.

With the exception of Cu, Cr, Mn, and Sr, the concentration of trace metals in produced waters is not much different from that found normally in seawater.

The six most toxic elements for marine organisms are considered to be mercury (Hg), cadmium (Cd), silver (Ag), nickel (Ni), selenium (Se), and lead (Pb). Produced waters do not normally contain concentrations of these six elements greater than those found in seawater. Recently, attention has been paid to the determination of the two most toxic elements (Hg and Cd) in effluents from a number of crude oil offshore production units. In essentially all samples examined, values were below the levels of detection which were 50 parts per billion Cd and 0.5 part per billion for Hg. Of lower toxicity, but still of concern, are copper (Cu), chromium (Cr), arsenic (As), zinc (Zn), and manganese (Mn). There seems to be no damage caused by the low levels at which these trace elements are present in produced waters.

A number of natural processes, such as chelation and absorption, among others, operate to reduce both the concentrations and toxicity of trace metals dissolved in water. In order for a heavy metal to be toxic it apparently must be in the ionic state. In most natural waters much of the free metal ions would probably be bound to organic substances naturally present in the water, decreasing the relative percentage of the ionic species. There is indirect evidence that organically chelated heavy metals in aqueous solutions do not have as great an effect upon organisms as do solutions of the metal salts. This could be due either to the fact that the organo-metallic complex is too bulky to enter a biological system or it could be due to the lack of availability of the metal for reaction with enzymes within the cells.

In addition to the possible environmental effects of trace elements in offshore produced waters, there are some additional components and properties of produced waters which have potential for minor environmental effects. These are salinity, dissolved oxygen, organic compounds other than hydrocarbons, and temperature.

Salinity. Many offshore produced waters have higher concentrations of dissolved solids than the waters surrounding the platforms. The average total dissolved solids content for produced formation waters from offshore Louisiana production facilities is approximately 110,000 mg/liter (ppm), compared with 35,000 mg/liter for normal seawater. Since we are dealing with dissolved components, dilution occurs quite rapidly when the produced waters are discharged into the waters surrounding the platform. Any environmental effects will be extremely localized near the point of discharge. Mackin (1973) states, "This dilution in large water bodies and comparatively deep water is almost instantaneous, and dilutions of 1,000 parts of seawater to one of brine can be effected in even comparatively shallow water in distances of from 8 to 50 feet. In offshore waters in the Gulf or elsewhere, there is no brine problem for that reason."

Salinity measurements were made at 180 different sampling stations offshore and in Timbalier Bay (Louisiana) (GURC, 1974). Variations were correlatable with season and geography of sampling sites and all variations were within the ranges reported by season.

Dissolved oxygen. Since oxygen is also a dissolved molecular species, the above comments about dilution apply here as well. Also, the GURC (1974) study found that natural processes (tides, floods, droughts, etc.) completely overshadowed any changes in dissolved oxygen content which might have been caused by the discharge of production waters. No significant depletion of oxygen was observed at platform sites and what small reduction was noted could be explained by the generally rich biota living on the platform legs.

Organic compounds, other than hydrocarbons. Other organics found in platform production waters will usually be present in even lower concentrations than the petroleum hydrocarbons associated with these waters. These other organics would likely be in the few ppm range and dilution would rapidly disperse them below the limits of any adverse environmental effects.

In the GURC study, measurements were made of the organic carbon content in the waters around two producing platforms and a control area some six miles away. Typical organic carbon contents measured around the platforms were 5.8 and 5.0 mg/liter (ppm), respectively, and 5.1 mg/liter (ppm) for the control area. Since these values are all within the sampling variability, it was indicated that there was no significant buildup of organic compounds in the vicinity of the producing platforms.

Temperatures. Production waters tend to be somewhat warmer than the water surrounding the platforms, but here again, the differences are not likely great. As with dissolved species, dilution would almost instantaneously diminish any temperature gradients. In the GURC study, temperature measurements were also made at some 180 different sampling stations offshore and in Timbalier Bay. As was found with salinity, the temperature variations correlated with season and nearness to shore, and no impact of the platforms and their discharges on the water temperature was noted.

A recent study of the Buccaneer oil field offshore Texas (NOAA, 1977), reported that produced water was discharged at a rate of 138 m^3 per day between January 1975 and February 1976. The average oil content of this produced water was 25.1 parts per million. Near-platform macro-benthic populations were depressed and had a high turnover rate as compared to the surrounding sea bottom. No cause-effect relationship was established, however.

OCS Order No. 7, requires all discharges must meet EPA standards which allow no more than 52 milligrams per liter (mg/l) daily maximum of oil and grease discharge and 30 mg/l maximum monthly average (52 mg/l is equivalent to 52 parts per million).

c. LIGHT HYDROCARBON DISCHARGE

Two oil industry practices which are important in the introduction of low molecular weight hydrocarbons to marine ecosystems are underwater venting of gases and the discharging of co-produced brines.

In one study (Brooks, et al.) the concentration of hydrocarbons in the vicinity of two underwater vents were not high enough to produce any apparent affect on phytoplankton productivity, except possibly in the immediate vicinity of the vent. Concentrations ranged from 0.51 to 1.65 mall of dissolved organic carbon.

d. PLATFORMS AND STRUCTURES

The number of platforms which will result from this sale has been estimated to be from 20 to 25. The number of underwater completions which will result from this sale has been estimated to be from 0 to 5.

Concern has been expressed by EPA and others about deepwater technology and regulations. Deepwater OCS Operating Orders have not been promulgated at this time, but preliminary studies related to subsea production systems are presently being conducted in the Gulf of Mexico. As of June 1978, there were 30 subsea completions, 20 of which were in operation. In addition, Gulf of Mexico OCS Order No. 5, "Subsurface Safety Devices" states in part: "The lessee shall: (1) in wells capable of flowing oil or gas, when required by the Supervisor, install and maintain in operating conditions storm chokes or similar subsurface safety devices; (2) for producing wells not capable of flowing oil and gas, install and maintain surface safety valves with automatic shutdown controls; and (3) periodically test or inspect such devices or equipment as prescribed by the Supervisor." The technology is basically not a function of water depth.

Furthermore, the USGS is establishing a Structural Verification. Program. The purpose of the OCS Structural Verification Program is to ensure that offshore oil and gas structures are designed, constructed, and installed using standardized procedures to prevent structural failures. This will be especially useful in the frontier and deep-water areas. The USGS requires the lessees to submit detailed information on any proposed structure to be erected. This platform verification program is designed to facilitate review of these proposed structures, as they are outlined in the operator's development plan. An important organizational element of the program is the Platform Verification Section (PVS) to be established within the Branch of Marine Oil and Gas Operations. The PVS will be organized for verification and reverification of new and, eventually, existing platforms. It is also proposed that implementation of the program will utilize, in the verification process, the expertise and technical input from third party quality control personnel representating engineering and scientific disciplines. A separate section with the infrastructure of the Geologic Division of GS will establish and maintain a management information system and associated environmental hazards data to generate extreme design parameters, to be used in platform design review and to monitor construction and installation procedures. Certified Verification Agencies will provide quality control services which are supplemental to those provided by the platform owner and contractor. Through these verification agencies and implementation of OCS Platform Verification Standards, the design, fabrication, and installation of new offshore structures will thus be reviewed in accordance with those standards and rules necessary to assure safe operations under expected environmental stresses.

Although subsea completion systems are not specifically addressed in the Verification Program, the OCS Operating Order give USGS the regulatory authority to promulgate regulations on a case by case basis in order to establish acceptable procedures for safety and environmental protection for each specific design. With subsea technology in a developmental state, it would be premature to establish permanent regulations for systems that may change in design in the near future.

Present oil industry technology is capable of exploring for, developing, and transporting onshore facilities potential reserves from those tracts in water depths to just over 1,000 feet. Behond that depth (and out to the maximum depth encountered in the sale area) the necessary exploratory equipment is available an much of the production gear is in various stages of design, development, or prototype production. Drilling in water deeper than 600 feet has been rountinely accomplished by the oil industry since the Exxon Company drilled a well in 632 feet of water in 1965. In April 1978, the dynamically positioned drillship DISCOVERER SEVEN SEAS completed an exploratory well in 4,346 feet of water off the Congo setting another new deepwater drilling record. During the period form 1975 to 1977, approximately 146 wells drilled in water deeper than 600 feet—68 of them being in depths beyond 1,000 feet (Oil and Gas Journal 76(7):25). The industry currently has an estimated 658 million acres under lease in water deeper than 600 feet. Most of that acreage includes 376 million in the Far East, 177 million off the coast of Africa, and 52 million off Latin America (OGJ 76(7):25).

2. Onshore Oil and Gas Operations

A. SUPPORT FACILITIES

Portions of the Louisiana and Texas coast have developed a nearly self-contained gas and oil related infrastructure in the form of service, support, production, transportation, storage, processing, facilities. The existing petroleum related infrastructure in Mississippi and Alabama is not as completely developed or as oriented toward offshore operations as that of Louisiana and Texas.

It is assumed that the location of sale-induced support facilities is only loosely correlated with specific offshore points, and that they will tend to locate in areas presently committed to and experiencing like facilities and inducements. In general, the types and extent of existing land development are strong determinants in setting the pattern for future land development.

Sale inducements are not generally expected to overload this existing capacity. Should the sale cause incremental increases in any segment of the infrastructure, such increases are likely to occur in presently industrialized areas.

Using the preceding estimates and general assumptions, the following development scheme and general land use requirements have been addressed: transport from production areas to shore; gas and oil pipeline development; oil transhipment; refinery construction; onshore support facilities. Each of these activities has not been developed in detail because of widely varying economic conditions, the unknown production characteristics of the wildcat acreage, and the wide range of development alternatives available to the producers. However, the following is one realistic onshore development alternative, and the following estimates and land use assumptions have been developed for each major activity.

(1) Transfer of crude oil production to processing sites by surface vessel.

Although the most likely method for the transfer of crude oil from marine production facilities to onshore storage facilities is by pipeline, certain environmental and economic factors could suggest that the crude production be transported by surface vessel from the production site to refining areas under some circumstances.

In the event that a gathering and storage facility, with provisions for loading surface marine vessels could be constructed, possible advantages might result. Possible earlier availability of the crude production, and the possible development of oil fields that would be too small to justify the installation of a pipeline could result. The environmental effects of such a development would depend on a relative weighing of possible adverse impacts on resources located on the OCS with the potential favorable effect resulting from adjacent high value onshore resources such as recreation beaches.

The most likely results are believed to be pipeline transportation to crude oil terminals located on shore, and shipment from these terminals by pipeline to existing refineries.

(2) Gas and oil pipeline development

In order to utilize any new oil and/or gas supplies discovered in the area of the possible sale, new short connecting lines to existing pipelines will be required.

(3) Oil transshipment

It is considered most likely that all oil production will be pipelined to shore, stored in tank farms, and finally transferred to existing refineries by means of pipelines.

(4) Possible refinery construction

Production from offshore areas will tend to offset declining onshore and offshore production. The total refinery and petrochemical capacities in the Alabama, Mississippi, Texas, and Louisiana coast have been and will continue to be in response to the region's need to supply oil products to adjacent regions and to meet its own needs, and this total will be derived independently of this lease-sale's possible contribution. Since this current capacity processes and will probably continue to process a combination of locally produced (onshore and offshore) and imported (domestic and foreign) crude oil; that produced by this sale is perceived to be inclusive of this total rather than constituting an additive factor.

(5) Support facilities, operating bases, etc.

Support facilities mean a wide variety of supply and service industries having capabilities to support the exploration, production and transportation of gas and oil. It includes companies dealing with tools, wireline, gas lift, cement, boats, etc., as well as machine and welding shops, trucking firms, wellhead and mud suppliers, supply stores, etc. Such capability is present in many industrialized areas within the Louisiana and Texas coastal areas, and to a lesser extent, in Mississippi, Alabama, and Florida and it is not anticipated that the sale will cause the construction of additional support facilities. Specifically, the USGS estimates that there will be no new direct service base needs as a result of this proposed sale.

The individual and total sale induced acreage is assumed to be very small, and these requirements may be widely dispersed over large portions of the coastal zone. It can be assumed that the region has many site alternatives to those indicated which could host the modest acreage requirements, should development of the sale be different from that assumed.

Industrial development was used as the basis for land use requirements, as its site demands are most relevant to sale related activities. However, in doing so, it is understood that this land use represents only one component of a balanced land use—population ratio. Industrial development induces new employees and activities into the general sale area, and these will be distributed to more specific areas. This suggests land use implications beyond these specifically addressed because of requirements for residential, commercial, recreation, and other land use categories.

Any population or industrial inducement can be perceived as creating environmental stress for a localized area or general region. Conversely, shifting of developmental pressure to such areas can be perceived as relieving stress in other areas. Whether the result is a net gain or loss of total environmental stress is partially dependent on the relative stresses experienced in the areas which gain or lose population. It is axiomatic that stress induced into an area can often be mitigated by rationally developed, goal-oriented policies and land use plans. Subsequent allocation of land in response to these demands remains a responsibility of state, regional, and local governments. Because of the time lag between the lease sale and the resulting land use impacts, there is sufficient lead time for these entities to develop responsive land use plans and policies.

B. EMPLOYMENT FLUCTUATIONS

To a large extent, variations of employment resulting from this proposed sale should not be a large burden on the existing infrastructure, since these activities will be a continuation of existing employment patterns.

3. Other Operations

A. TRANSPORTATION

The following discussion presents the basic assumptions upon which the development scenario was developed and from which the anticipated environmental impacts resulting from this proposed sale were derived.

(1) Pipelines

Because the proposed lease sale is for tracts within close proximity to currently developed OCS areas, it is assumed that no new pipeline land falls will occur unless production occurs in an area remote from existing pipelines. As a result, the only area where it is anticipated that a new pipleline may be require is offshore of south Texas. Tracts proposed for leasing in this area are estimated to be gas prone. Should a new gas transmission line be required, it is logical to assume that it would proceed to a landfall in the vicinity of Brownsville/Corpus Christi, an area of existing gas processing facilities.

It is assumed that production resulting from this proposed sale will be piped to shore via existing pipelines and that new pipeline construction will be therefore confined to the placement of from 100 to 200 miles of gathering lines connecting existing facilities.

(2) Barges and Tankers

Because of the relatively short pipeline distances that would be required as a result of this proposed sale it has been assumed that connecting lines between new production sites and existing pipeline facilities will be constructed prior to production. It has been further assumed that all production resulting from this sale will be brought ashore via pipeline and therefore, the use of tankers and/or barges for transporting produced oil and/or gas is not anticipated.

(3) Boats

A publication by the New England River Basins Commission (NERBC) and the Resource and Lands Investigations Program (RALI) of the U.S. Department of the Interior (NERBC-RALI, 1976) estimates that a maximum of three supply boats and one crew boat are required to service each drilling rig during the exploratory phase; a maximum of four supply boats and one crew boat are required to service each platform during production drilling; and, one supply boat is needed for every two platforms during actual production and workover.

It is assumed that use of crew and supply boats will increase by up to 48 boats for exploration and 100 boats during production. This assumption appears reasonable because: 1) the tracts offered in this proposed sale are in close proximity to existing activities and therefore boats supporting existing activities can also support activities resulting from the current sale. Each boat owner will try to maximize the use of his boat in order to achieve maximum economy of operation; 2) declines in exploratory and production activities at existing offshore facilities will allow shifting of crew and work boat schedules to accommodate new activities resulting from this proposed sale.

(4) Aircraft

Helicopters are the primary mode of air transportation used to transport personnel and supplies between on-shore service bases and offshore rigs and platforms. NERBC-RALI (1976) estimate that one helicopter per drilling rig is required during the exploratory drilling phase, two helicopters are needed per platform during production drilling and a maximum of one helicopter per platform is required during actual production and workover. In practice, in areas where several rigs and/or platforms are in use simultaneously, one helicopter may service more than one rig or platform thus an economy of scale may result. As with boats, idle time means lost money, so owners of existing helicopters will try to maximize utilization of aircraft.

Because of areal production characteristics, that is, because the general area in which the proposed sale will occur has been subject to intensive activity, it is assumed that activities resulting from the current sale will be accommodated by existing helicopter services located at existing bases. Therefore, it has been assumed that a substantial increase in helicopter traffic will not result.

c. ACCIDENTS

(1) Geologic Hazards

Geologic hazards with a potential for causing accidents are: unconsolidated gas saturated delta sediments, faulting and bottom roughness.

Unconsolidated gas saturated delta sediments have moved with sufficient force to jeopardize drilling and production platforms. On August 17, 1969 following hurricane Camille, it was discovered that Shell Oil Company's South Pass 70 "B" platform and the Gulf Oil platform on Block 61 had been lost. A report on the investigation of the loss concluded that South Pass 70B structure failed primarily because of seafloor soil movements.

Gas escaping from sediments at intermediate and deep depths migrate along fault plains and faulty cement jobs around surface casing may cause serious problems during drilling operations. Pennzoil's A-5 well, High Island A-563 blew out of control early on November 6, 1976 and the entire platform and drilling rig sank into the crater formed by the escaping gas and saltwater. The probable underlying cause for the eventual loss of control was earlier drillpipe fishing operations which damaged the surface pipe integrity. The platform toppled simply because the sediments around the pilings were removed as the crater expanded.

Bottom roughness and steep slopes are potential hazards but less likely to cause accidents since accurate bathymetric and shallow seismic surveys normally alert the drilling contractor to these conditions.

(2) Oil Spills

All phases of petroleum development from exploration to processing have the potential for contributing to oil spills. Oil spills are recognized as the most common cause of environmental damage associated with offshore petroleum development. The following discusses the causes and effects of oil spills.

The most important feature of oil spills reported by CEQ (1974) is the size of individual spills which range from a fraction of a barrel to over 15,000 barrels. Most spills are at the low end of this range; in 1972, 96 percent of spills were less than 24 barrels (1,000 gallons). A few very large spills account for most of the oil spilled (the Torrey Canyon accident of 1967 in Great Britain spilled twice as much oil as was reported spilled in the United States in 1970). In 1967 and 1972, a total of four spills accounted for 75 percent of all oil spilled in the U.S. as a result of offshore oil and gas operations. Because amounts spilled per incident can vary by a factor of one million, it is meaningless to estimate average amounts of oil that might be spilled during development. Data supplied by the Geological Survey for the period of 1964-1976 indicate a total of 27 major oil spill incidents connected with Federal OCS oil, gas and condensate (table 37). The estimated total volume of oil spilled during this period as a result of these incidents is at least 327,659 barrels (13.8 million gallons). Table 37 compares oil spill incidents to total production for the years 1964-1976.

Pipeline Break and Leaks

There have been 17 reported pipeline breaks and leaks, of greater than 50 barrels each, in the Gulf of Mexico 1967-1976. The total volume of oil spilled due to these accidents is approximately 26,588 barrels. This volume amounts to .0009 percent of the total Gulf of Mexico OCS production since 1967. Assuming the USGS estimates of recoverable resources for this proposed sale of 21.6-59.8 million barrels, from 194 to 538 barrels could be spilled from pipelines as a result of this proposal.

Since 1971, information on pipeline leaks of all sizes has been maintained. Statistics on such spills can be found in Geological Survey Circular 741. Figure 32 illustrates principal causes of pipeline and pump spills of 1-50 barrels, by year and volume for the Gulf of Mexico.

Since 1970, 72.9 percent of the total volume of oil spilled by pipelines was the result of ship anchors dragging across the pipeline causing them to rupture. Other causes of pipeline damage include movement due to wave action during storms, impact of trawl boards of commercial fishing boats, and corrosion of the line due to formation water that is produced with the oil.

Blowouts

It is possible for oil or gas wells to blow out of control during drilling operations, completion and production. Blowouts may be prevented during drilling by increasing mud weight and activating blowout preventers. When a well is completed, a subsurface safety device is installed to prevent

Table 37
Major Oil Spills - Gulf of Mexico OCS, 1964-76

Year	Incidents	Oil Spilled (B)	Fixed Structures	Annual OCS Production (MB)
1964	5	14,928	1,100	123
1965	2	2,188	1,200	145
1966	0	0	1,325	189
1967	1	160,639	1,450	222
1968	1	6,000	1,575	269
1969	4	10,624	1,675	313
1970	3	83,895	1,800	361
1971	1	450	1,891	419
1972	0	0	1,935	412
1973	4	22,175	2,001	395
1974	2	22,046	2,054	361
1975	1	N/A	2,079	328
1976	3	4,714	2,102	320
Total	27	327,659		3,859

Source: U.S. Department of the Interior, GS, 1977.

Notes: (B) Barrels
(MB) one million barrels

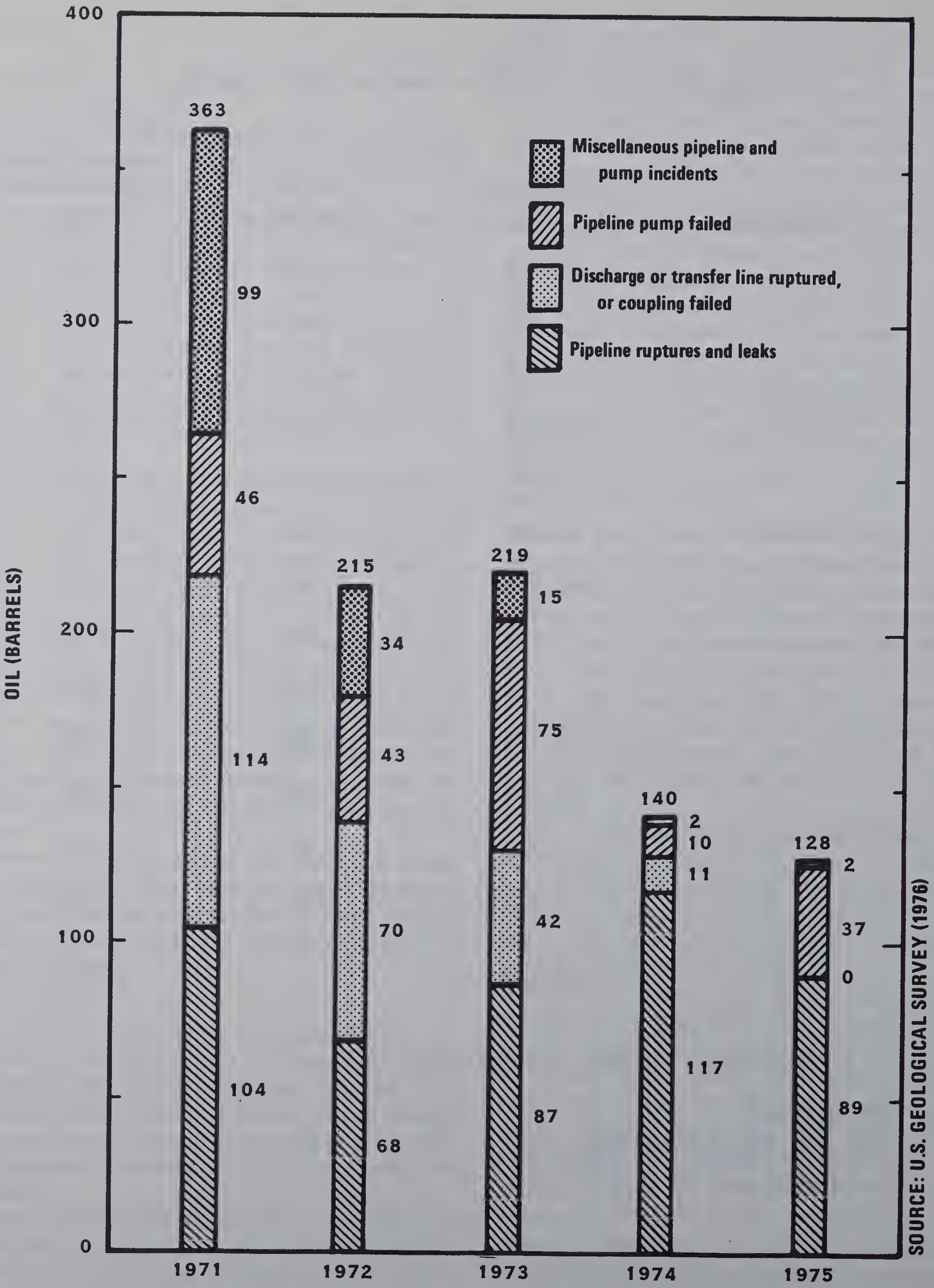
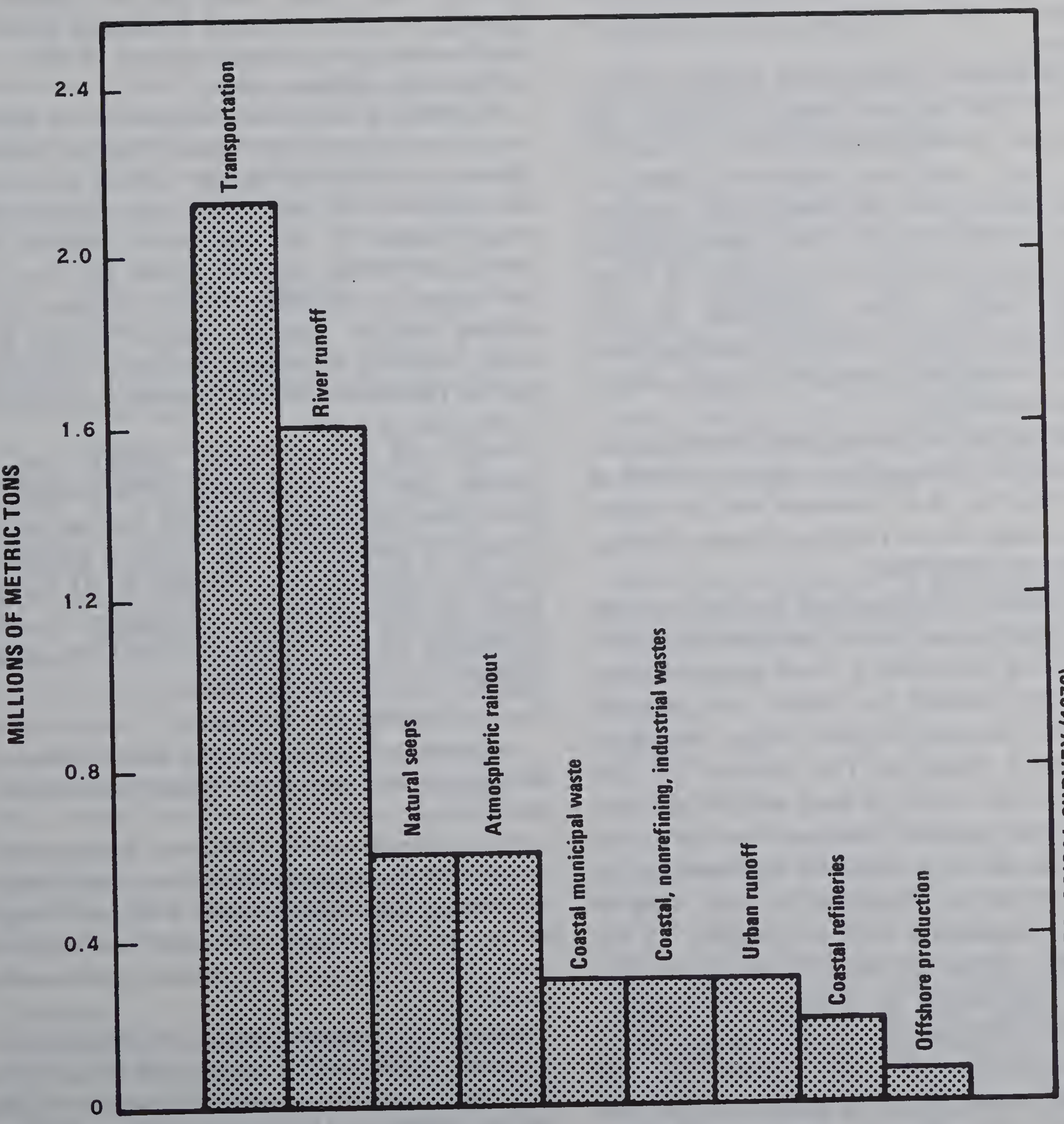


FIGURE 32

CAUSES OF PIPELINE RELATED OIL SPILLS, 1971-1975



SOURCE: U.S. GEOLOGICAL SURVEY (1976)

FIGURE 33

ANNUAL VOLUME OF PETROLEUM HYDROCARBONS INTRODUCED INTO WORLD'S OCEANS the well from blowing out if surface control is lost.

A gas well blowout may cause considerable resuspension of sediments. An oil well blowout can release large quantities of drill muds and cuttings, as well as oil and gas into the marine environment.

Gulf of Mexico OCS statistics indicate that an average of one blowout occurs for every 245 wells drilled, spilling approximately 1,294 barrels of oil each. Not one pollution incident by blowout, greater than 200 barrels, has occurred since 1971 (USDI, USGS, 1976). Most blowouts causing spillage result from producing oil wells, not wells being drilled. Producing oil well blowouts are normally a result of equipment malfunctions, workover procedures, human errors, storms and collisions.

It is estimated that between 60-150 wells would result from this proposed sale. Based on Gulf of Mexico statistics, it is estimated that up to two blowouts could result from exploratory drilling, production or completion.

In November 1976, a gas well blowout occurred in High Island Area, South Addition Block 563. The following discussion is based on the final report of the incident by Brooks and Bernard (1977). The blowout occurred during drilling at about 1830 m (6,000 ft). The platform was lost and a crater 137 m (450 ft) deep and 487 m (1,600 ft) wide was created. This was the fifth well drilled from the same platform, and some of the previous wells had penetrated to near 3048 m (10,000 ft), apparently with no problems. At the time of this writing the cause of the blowout had not been determined, but a wet, oil-related gas, deeper than the biogenic gas noted at the crater some four months after the blowout, was the most likely cause. The bulk of the "several million tons" of sediment resuspended by the blowout was redeposited within 600 m (1,970 ft), but redeposited sediment was detected up to 2,440 m (8,000 ft). Five months after the blowout, a gas "seepage" of about 400,000 cu ft per day continued causing a visible plume of suspended sediment from the crater. Certainly such a blowout could cause extensive damage to any nearby area of high biological productivity, such as a coral reef or live bottom areas.

Explosions and Fires

Combustible hydrocarbon liquids or vapors making contact with arcing electrical or overhead mechanical devices are thought to cause most platform fires. More rarely they are ignited by lightning or static electricity. Sometimes platform fires involve the accidental ignition of fuel, solvent or heat exchanger fluids.

If producing wells are damaged to the extent that oil flows freely and ignites, they are usually allowed to burn while remote control operations are underway. In this way, most hydrocarbon liquid expelled by the well burns, reducing the fire hazard during relief operations and lowering the volume of oil dispersed into the ocean. If a blowing well is releasing mostly natural gas, ocean pollution is minimal. However, personnel and the platform or drilling structure are imperiled in the event of a fire.

From 1956 to 1977, many platform fires of varying sizes occurred during OCS production. Most were extinguished without causing serious damage or pollution. Of 199 recorded explosions and fires, nine had spills totalling 87,141 barrels. When the amount spilled is compared to total production of 3,537 million barrels, the annual spillage rate is 0.0025 percent.

Tanker Accidents and Operations

Accidents, release almost 36.5 million barrels of oil annually into the world's ocean (Charter et al., 1973).

About 98 percent of all of the oil spilled by vessels is from incidents involving over 1,000 barrels. Most large tanker spills occur nearshore (within 80 km of land) when the vessel runs aground, rams a fixed structure or collides with another vessel.

During 1973, approximately 1,404 billion tons of oil were transported by tankers; about 1,355 billion tons of crude were similarly transported during 1971 (National Academy of Sciences, 1975).

From 1969 to 1973, a total of 950,000 long tons of oil were spilled by tankers Card et al., 1975; average annual spill volume was 190,000 long tons (13.5 million barrels). A ratio of volume transported (10 billion barrels) to volume spilled (1.35 million barrels) results in a spillage rate of 0.013 percent. The CEQ (1974) report lists a spillage rate for tankers of 0.016 percent. The above spillage rate calculations reflect 10 billion barrels. Tankers probably will not be used to transport production from offshore to onshore facilities as long as pipelines are technically and economically feasible. Pipelines will carry the production from offshore platforms to onshore storage facilities.

(3) Occupational hazards

The protection of life is an important factor in all drilling and producing operations. Since offshore operations pose a higher risk, greater emphasis is placed on safety. OCS Order No. 8 provides for employee orientation and motivation programs for personnel working offshore. Operating companies have developed policies, standards, practices and/or procedures to provide the necessary protection of offshore personnel. These safety efforts include defining and providing proper training for all offshore personnel, especially the new employee. Each employee receives orientation and/or instructions before he departs for his offshore post.

The recommended practice sets the minimum standards and procedures for all persons who go offshore. It consists of two basic parts, a checklist to develop an orientation program and orientation material. The checklist of topics includes work clothes; no firearms, illegal drugs or alcoholic beverage; transportation by helicopter and boat. Offshore regulations are covered, some of which are life jacket regulations; fire systems and equipment; location and type of first aid, shut down procedures, and evacuation procedures.

Although precautions are taken accidents still occur. Table 41 indicates the number of personnel fatalities and injuries that occurred from 1970–1976. It is noted that in view of the number of personnel that work offshore, the number of accidents is considerably low.

4. Matrix Analysis

A. PURPOSE

This matrix analyzes potential impacts that may result from this proposed sale. The distance from shore, water depth, and expected reserve of each proposed tract is analyzed. In addition, the sensitivity of selected environmental factors to the effects of an oil spill or construction of structures is evaluated by means of a sensitivity rating.

B. ENVIRONMENTAL FACTORS

The matrix examines selected bilogical and cultural factors which could sustain negative impacts as a result of the development of the proposed tracts. These environmental factors include:

littoral systems—all shorelines features
reef systems—high relief banks with dense epifaunal communities
other benthic systems—bottom-living organisms
endangered species—designated critical habitat
commercial fishing—shrimp, menhaden, industrial fish, and hook and line fishing offshore
shipping—major shipping lanes
aesthetics—visibility of exploratory drilling rigs, production platforms, and other structures

These factors were analyzed by measuring the distance from the edge of the proposed tract to the potentially affected resource

C. IMPACT PRODUCING FACTORS

This evaluation considered the sensitivity of environmental factors to the occurrence of oil spills of 100,000 gallons (2,381 bbls) or more (a major spill as designated by the National Oil and Hazardous Substances Pollution Contingency Plan) and structures including platforms, other fixed structures, or artificial islands.

Other impact-producing factors, such as debris resulting from drilling activities and pipeline construction were not analyzed on a tract-by-tract basis.

D. SENSITIVITY RATING

Each tract was assigned a sensitivity value for oil spills and structures based on its distance from a particular resource. These values for potential impact included:

1-Minimum
2-Moderate
3-Maximum

(1) OIL SPILLS

Major oil spills were considered to be potentially damaging to all resources except shipping. If a spill occurred within 9 nmi of any resource, it probably would not be effectively contained before contacting that resource. For this reason, the highest sensitivity rating was established for 9 nmi or less from littoral systems, reef systems, endangered species, and aesthetics. Within 9–17 nmi the probability of contact is sufficient to warrant concern. Beyond 17 nmi the possibility of contact still exists, but is remote.

The sensitivity rating for benthic systems and commercial fishing is based upon depths to which oil is expected to be entrained in the Gulf. In nearshore areas, 10 m or less, a spill would almost certainly contact bottom sediments potentially damaging benthic systems and tainting demersal fishes. Under extreme conditions, the depth to which oil might be entrained was assumed to be 20 m or less. Sediments at depths

Table 41
Fatalities and Injuries - Gulf of Mexico OCS, 1970-76

Year	Blowouts Fatalities	Blowouts Injuries	Fires and Explosions Fatalities	Fires and Explosions Injuries	Miscellaneous Fatalities	Miscellaneous Injuries	Total Fatalities	Total Injuries
1970	4	27	17	31	12	0	33	58
1971	0	0	1	16	10	0	11	16
1972	0	0	0	9	10	0	10	9
1973	0	3	2	9	7	3	9	15
1974	0	0	0	15	9	7	9	22
1975	0	1	10	11	7	2	17	14
1976	0	0	0	14	13	14	13	28
Total	4	31	30	105	68	26	102	162

Source: U.S. Department of the Interior, GS, 1977.

greater than 20 m have little chance of being contaminated except in the immediate vicinity of the spill site. These considerations resulted in the following sensitivity ratings:

Littoral system
  1-greater than 17 nmi
  2-9-17 nmi
  3-within 9 nmi

Reef system
  1-greater than 17 nmi
  2-9-17 nmi
  3-within 9 nmi

Benthic system
  1-greater than 20 m depth
  2-11-20 m depth
  3-less than 10 m depth

Endangered species
  1-greater than 17 nmi
  2-9-17 nmi
  3-within 9 nmi

Commercial fishing
  1-greater than 20 m depth
  2-11-20 m depth
  3-less than 10 m depth

Aesthetics
  1-greater than 17 nmi
  2-9-17 nmi
  3-within 9 nmi

(2) STRUCTURES

It is estimated that tracts 4,997 ac or more in size would average two structures per tract and remain for 15-20 years. Structures may have a negative effect on reef systems, commercial fishing, shipping, and aesthetics.

Reef systems containing coral and associated organisms are very sensitive to disturbances such as turbidity caused by the discharge of drilling muds and cuttings. The distribution of nekton may also be affected by the structure. The sensitivity rating for reef systems is conservative due to our lack of information regarding the distribution of drilling muds and cuttings under operational conditions in the marine environment.

Structures interfere with commercial fishing by removing trawling and purse seining areas. Approximately 70 percent of the catch by these methods in the Gulf is inshore of the 20 m isobath. The remainder of the catch is concentrated between the 20 m-200 m isobath.

Structures pose a collision hazard to shipping and boating, but are especially hazardous when placed near fairways or anchorage areas and are rated accordingly.

The aesthetic sensitivity rating is based on the visibility from sea level of a 108 ft. (33 m) tall structure. Within 9 nmi of shore, such a structure would be obvious. Within 9-13 nmi it would be hardly visible; while greater than 13 nmi from shore, the aesthetic impact would be negligible except for the boating community. These considerations resulted in the following sensitivity ratings:

Reef Systems
  1-greater than 2.6 nmi
  2-.86-2.6 nmi
  3-less than .8 nmi

Commercial Fishing
  1-greater than 200 m depth
  2-20-200 m depth
  3-less than 20 m depth

Shipping
  1-greater than 2.6 nmi
  2-.86-2.6 nmi
  3-less than .8 nmi

Aesthetics
  1-greater than 13 nmi
  2-9-13 nmi
  3-less than 9 nmi

E. SUMMARY

This analysis of the effects of oil spills and structures on certain environmental factors is based on the sensitivity values. Impacts upon individual resources are totaled resulting in a cumulative impact. This total is divided by the total possible value, thereby resulting in an impact index. For example, tract number 48 has a cumulative impact for structures of 5 our of 12 for an impact index of .42. The same tract has a cumulative impact for oil spills of 6 out of 18 for an impact index of .33. These are summed for an additive impact of .75.

The impact index rating can be evaluated as follows:

Impact Index
  0.33-0.55 Minimum
  0.56-0.77 Moderate
  0.78-1.00 Maximum

Additive Impact
  0.33-0.88 Minimum
  0.89-1.43 Moderate
  1.44-2.00 Maximum

Table 38 provides a summary of additive potential impacts.
Table 39 provides a summary of maximum potential impacts.
Table 40 provides a tract-by-tract matrix analysis.

B. Biological Environment

1. Phytoplankton

The oil and gas exploratory phase will have a localized effect on the phytoplankton in the

Table 38. Summary of Additive Potential Impacts

Additive Impact	Tracts	Total
0.33-0.88 (minimum)	1-43, 45-62, 69-74, 77-80, 85-89, 95, 103-115	90
0.89-1.43 (moderate)	63-68, 75, 76, 83, 84, 90, 92-94, 96-102	21
1.44-2.00 (maximum)	44, 81, 82, 91	4

Table 39. Summary of Maximum Potential Impacts

Environmental Factor	Tracts	Total
Littoral Systems	44, 81-84, 91, 93, 94, 96-99, 102	19
Reef Systems	20, 61, 62, 115	4
Other Benthic Systems	44, 63-68, 81, 82, 91	10
Endangered Species		0
Commercial Fishing	13-15, 18, 24-29, 38-40, 44-47, 63-69, 74-76, 81-84, 91, 97, 98	34
Shipping	7, 9, 12-14, 16-18, 24, 29, 30, 32, 33, 44, 100-102, 108, 113, 114	20
Aesthetics	25, 26, 38, 44, 45, 81-84, 91, 93, 94, 96-99, 102	17

TABLE 40 MATRIX ANALYSIS

PROPOSED TRACTS 58A					ENVIRONMENTAL FACTORS							IMPACT		
					BIOLOGICAL				CULTURAL					
Tract	Lease Number	Distance from Shore (nautical miles)	Water Depth (meters)	Reserve	Littoral Systems	Reefal Systems	Other Benthic Systems	Endangered Species	Commercial Fishing	Shipping	Aesthetics	Cumulative Impact	Impact Index	Additive Impact
1	PS A-43	43	78	G	NA –	1 –	NA –	NA –	2 –	1 NA	1 –	5 –	.42 –	.42
2	PS A-54	43	78	G	NA –	1 –	NA –	NA –	2 –	1 NA	1 –	5 –	.42 –	.42
3	PN 947	17	36	G	NA –	1 –	NA –	NA –	2 –	1 NA	1 –	5 –	.42 –	.42
4	PN 957	13	32	G	NA –	1 –	NA –	NA –	2 –	1 NA	2 –	6 –	.50 –	.50
5	MU 759	27	50	G	NA –	1 –	NA –	NA –	2 –	1 NA	1 –	5 –	.42 –	.42
6	MU A-84	39	85	G	NA –	1 –	NA –	NA –	2 –	1 NA	1 –	5 –	.42 –	.42
7	MI 566	13	23	G	NA –	1 –	NA –	NA –	2 –	3 NA	2 –	8 –	.67 –	.67
8	MI 680	24	44	G	NA –	1 –	NA –	NA –	2 –	1 NA	1 –	5 –	.42 –	.42
9	MI 698	14	26	G	NA –	1 –	NA –	NA –	2 –	3 NA	1 –	7 –	.58 –	.58
10	MI 709	26	48	G	NA –	1 –	NA –	NA –	2 –	1 NA	1 –	5 –	.42 –	.42
11	BA A-78	37	50	G	NA –	1 –	NA –	NA –	2 –	1 NA	1 –	5 –	.42 –	.42
12	BA A-131	39	62	G	NA –	1 –	NA –	NA –	2 –	3 NA	1 –	7 –	.58 –	.58

TABLE 40 (CON'T)

PROPOSED TRACTS 58A					ENVIRONMENTAL FACTORS							IMPACT		
					BIOLOGICAL				CULTURAL					
	Tract Lease Number	Distance from Shore (nautical miles)	Water Depth (meters)	Reserve	Littoral Systems	Reefal Systems	Other Benthic Systems	Endangered Species	Commercial Fishing	Shipping	Aesthetics	Cumulative Impact	Impact Index	Additive Impact
13	GA 239	17	16	G	NA / –	1 / –	NA / –	NA / –	3 / –	3 / NA	1 / –	8 / –	.67 / –	.67
14	GA 240	16	18	G	NA / –	1 / –	NA / –	NA / –	3 / –	3 / NA	1 / –	8 / –	.67 / –	.67
15	GA 241	14	18	G	NA / –	1 / –	NA / –	NA / –	3 / –	2 / NA	1 / –	7 / –	.58 / –	.58
16	GA 424	13	31	G	NA / –	1 / –	NA / –	NA / –	2 / –	3 / NA	2 / –	8 / –	.67 / –	.67
17	GA A-128	55	50	G	NA / –	1 / –	NA / –	NA / –	2 / –	3 / NA	1 / –	7 / –	.58 / –	.58
18	HI 154	16	15	G	NA / –	1 / –	NA / –	NA / –	3 / –	3 / NA	1 / –	8 / –	.67 / –	.67
19	HI A-495	80	70	G	NA / –	1 / –	NA / –	NA / –	2 / –	2 / NA	1 / –	5 / –	.42 / –	.42
20	HI A-514	73	62	G	NA / –	3 / –	NA / –	NA / –	2 / –	1 / NA	1 / –	7 / –	.58 / –	.58
21	HI A-515	74	62	G	NA / –	1 / –	NA / –	NA / –	2 / –	1 / NA	1 / –	5 / –	.42 / –	.42
22	HI A-541	76	68	G	NA / –	1 / –	NA / –	NA / –	2 / –	1 / NA	1 / –	5 / –	.42 / –	.42
23	HI A-346	87	80	G	NA / –	1 / –	NA / –	NA / –	2 / –	1 / NA	1 / –	5 / –	.42 / –	.42
24	SL 11	11	8	G	NA / –	1 / –	NA / –	NA / –	3 / –	3 / NA	2 / –	9 / –	.75 / –	.75

TABLE 40 (CON'T)

PROPOSED TRACTS 58A					ENVIRONMENTAL FACTORS							IMPACT		
					BIOLOGICAL				CULTURAL					
Tract	Lease Number	Distance from Shore (nautical miles)	Water Depth (meters)	Reserve	Littoral Systems	Reefal Systems	Other Benthic Systems	Endangered Species	Commercial Fishing	Shipping	Aesthetics	Cumulative Impact	Impact Index	Additive Impact
25	WC 29	3	8	G	NA –	1 –	NA –	NA –	3 –	1 NA	3 –	8 –	.67 –	.67
26	WC 30,31	3	8	G	NA –	1 –	NA –	NA –	3 –	1 NA	3 –	8 –	.67 –	.67
27	WC 96	13	10	G	NA –	1 –	NA –	NA –	3 –	2 NA	2 –	9 –	.75 –	.75
28	WC 113	15	10	G	NA –	1 –	NA –	NA –	3 –	2 NA	1 –	7 –	.58 –	.58
29	WC 199	26	17	G	NA –	1 –	NA –	NA –	3 –	3 NA	1 –	8 –	.67 –	.67
30	WC 393	54	24	G	NA –	1 –	NA –	NA –	2 –	3 NA	1 –	7 –	.58 –	.58
31	WC 431	58	30	G	NA –	1 –	NA –	NA –	2 –	1 NA	1 –	5 –	.42 –	.42
32	WC 446	65	35	G	NA –	1 –	NA –	NA –	2 –	3 NA	1 –	7 –	.58 –	.58
33	WC 491	75	42	G	NA –	1 –	NA –	NA –	2 –	3 NA	1 –	7 –	.58 –	.58
34	WC 575	87	65	G	NA –	1 –	NA –	NA –	2 –	1 NA	1 –	5 –	.42 –	.42
35	WC 618	96	96	G	NA –	1 –	NA –	NA –	2 –	1 NA	1 –	5 –	.42 –	.42
36	WC 631	101	102	G	NA –	1 –	NA –	NA –	2 –	1 NA	1 –	5 –	.42 –	.42

TABLE 40 (CON'T)

PROPOSED TRACTS 58A				ENVIRONMENTAL FACTORS							IMPACT		
				BIOLOGICAL				CULTURAL					
Tract Lease Number		Distance from Shore (nautical miles)	Water Depth (meters)	Reserve	Littoral Systems	Reefal Systems	Other Benthic Systems	Endangered Species	Commercial Fishing	Shipping	Aesthetics	Cumulative Impact	Impact Index	Additive Impact
37	WC 636	102	110	G	NA / –	2 / –	NA / –	NA / –	2 / –	1 / NA	1 / –	6 / –	.50 / –	.50
38	EC 25	7	11	G	NA / –	1 / –	NA / –	NA / –	3 / –	1 / NA	3 / –	8 / –	.67 / –	.67
39	EC 90	19	18	G	NA / –	1 / –	NA / –	NA / –	3 / –	1 / NA	1 / –	6 / –	.50 / –	.50
40	EC 105	25	20	G	NA / –	1 / –	NA / –	NA / –	3 / –	1 / NA	1 / –	6 / –	.50 / –	.50
41	EC 130	31	23	G	NA / –	1 / –	NA / –	NA / –	2 / –	1 / NA	1 / –	5 / –	.42 / –	.42
42	EC 262	68	46	G	NA / –	1 / –	NA / –	NA / –	2 / –	1 / NA	1 / –	5 / –	.42 / –	.42
43	EC 329	84	76	G	NA / –	1 / –	NA / –	NA / –	2 / –	2 / NA	1 / –	6 / –	.50 / –	.50
44	VR 27	3	7	OG	NA / 3	1 / 1	NA / 3	NA / 1	3 / 1	3 / NA	3 / 3	10 / 12	.83 / .67	1.50
45	VR 59	5	12	G	NA / –	1 / –	NA / –	NA / –	3 / –	1 / NA	3 / –	8 / –	.67 / –	.67
46	VR 100	23	19	G	NA / –	1 / –	NA / –	NA / –	3 / –	1 / NA	1 / –	6 / –	.50 / –	.50
47	VR 112	26	15	G	NA / –	1 / –	NA / –	NA / –	3 / –	1 / NA	1 / –	6 / –	.50 / –	.50
48	SM 18	34	25	OG	NA / 1	1 / 1	NA / 1	NA / 1	2 / 1	1 / NA	1 / 1	5 / 6	.42 / .33	.75

TABLE 40 (CON'T)

PROPOSED TRACTS 58A					ENVIRONMENTAL FACTORS							IMPACT		
					BIOLOGICAL				CULTURAL					
Tract	Lease Number	Distance from Shore (nautical miles)	Water Depth (meters)	Reserve	Littoral Systems	Reefal Systems	Other Benthic Systems	Endangered Species	Commercial Fishing	Shipping	Aesthetics	Cumulative Impact	Impact Index	Additive Impact
49	SM 26	37	27	O G	NA / 1	1 / 1	NA / 1	NA / 1	2 / 1	1 / NA	1 / 1	5 / 6	.42 / .33	.75
50	VR 273	104	53	O G	NA / 1	1 / 2	NA / 1	NA / 1	2 / 1	1 / NA	1 / 1	5 / 7	.42 / .39	.81
51	VR 289	109	55	G	NA / –	1 / –	NA / –	NA / –	2 / –	1 / NA	1 / –	5 / –	.42 / –	.42
52	VR 311	71	61	G	NA / –	1 / –	NA / –	NA / –	2 / –	1 / NA	1 / –	5 / –	.42 / –	.42
53	VR 315	73	53	G	NA / –	1 / –	NA / –	NA / –	2 / –	1 / NA	1 / –	5 / –	.42 / –	.42
54	VR 381	88	104	G	NA / –	1 / –	NA / –	NA / –	2 / –	1 / NA	1 / –	5 / –	.42 / –	.42
55	SM 82	57	43	OG	NA / 1	1 / 1	NA / 1	NA / 1	2 / 1	1 / NA	1 / 1	5 / 6	.42 / .33	.75
56	SM 83	57	44	OG	NA / 1	1 / 1	NA / 1	NA / 1	2 / 1	1 / NA	1 / 1	5 / 6	.42 / .33	.75
57	SM 90	59	47	OG	NA / 1	1 / 1	NA / 1	NA / 1	2 / 1	1 / NA	1 / 1	5 / 6	.42 / .33	.75
58	SM 91	58	47	OG	NA / 1	1 / 1	NA / 1	NA / 1	2 / 1	1 / NA	1 / 1	5 / 6	.42 / .33	.75
59	SM 119	70	60	G	NA / –	1 / –	NA / –	NA / –	2 / –	1 / NA	1 / –	5 / –	.42 / –	.42
60	SM 123	65	60	G	NA / –	1 / –	NA / –	NA / –	2 / –	1 / NA	1 / –	5 / –	.42 / –	.42

TABLE 40 (CON'T)

PROPOSED TRACTS 58A					ENVIRONMENTAL FACTORS							IMPACT		
					BIOLOGICAL				CULTURAL					
Tract	Lease Number	Distance from Shore (nautical miles)	Water Depth (meters)	Reserve	Littoral Systems	Reefal Systems	Other Benthic Systems	Endangered Species	Commercial Fishing	Shipping	Aesthetics	Cumulative Impact	Impact Index	Additive Impact
61	SM 156	72	75	OG	NA / 1	1 / 3	NA / 1	NA / 1	2 / 1	1 / NA	1 / 1	5 / 8	.42 / .44	.86
62	SM 157	71	75	OG	NA / 1	1 / 3	NA / 1	NA / 1	2 / 1	1 / NA	1 / 1	5 / 8	.42 / .44	.86
63	SM 238	10	6	OG	NA / 2	1 / 1	NA / 3	NA / 1	3 / 3	1 / NA	2 / 2	7 / 12	.58 / .39	.97
64	SM 239	10	6	OG	NA / 2	1 / 1	NA / 3	NA / 1	3 / 3	1 / NA	2 / 2	7 / 12	.58 / .67	1.25
65	SM 240	12	7	OG	NA / 2	1 / 1	NA / 3	NA / 1	3 / 3	1 / NA	2 / 2	7 / 12	.58 / .67	1.25
66	SM 241	12	7	OG	NA / 2	1 / 1	NA / 3	NA / 1	3 / 3	1 / NA	2 / 2	7 / 12	.58 / .67	1.25
67	EI 46	12	6	OG	NA / 2	1 / 1	NA / 3	NA / 1	3 / 3	1 / NA	2 / 2	7 / 12	.58 / .67	1.25
68	EI 49	15	6	OG	NA / 2	1 / 1	NA / 3	NA / 1	3 / 3	1 / NA	1 / 2	6 / 12	.50 / .67	1.17
69	EI 135	33	20	G	NA / –	1 / –	NA / –	NA / –	3 / –	1 / NA	1 / –	6 / –	.50 / –	.50
70	EI 155	36	23	G	NA / –	1 / –	NA / –	NA / –	2 / –	1 / NA	1 / –	5 / –	.42 / –	.42
71	EI 297	54	63	OG	NA / 1	1 / 2	NA / 1	NA / 1	2 / 1	1 / NA	1 / 1	5 / 7	.42 / .39	.81
72	EI 303	57	67	OG	NA / 1	1 / 2	NA / 1	NA / 1	2 / 1	1 / NA	1 / 1	5 / 7	.42 / .39	.81

TABLE 40 (CON'T)

PROPOSED TRACTS 58A					ENVIRONMENTAL FACTORS							IMPACT		
					BIOLOGICAL				CULTURAL					
Tract	Lease Number	Distance from Shore (nautical miles)	Water Depth (meters)	Reserve	Littoral Systems	Reefal Systems	Other Benthic Systems	Endangered Species	Commercial Fishing	Shipping	Aesthetics	Cumulative Impact	Impact Index	Additive Impact
73	EI 375	74	103	G	NA –	1 –	NA –	NA –	2 –	1 NA	1 –	5 –	.42 –	.42
74	SS 133	22	11	G	NA –	1 –	NA –	NA –	3 –	1 NA	1 –	6 –	.50 –	.50
75	SS 156	25	15	OG	NA 1	1 1	NA 2	NA 1	3 2	1 NA	1 1	6 8	.50 .44	.94
76	SS 157	24	14	OG	NA 1	1 1	NA 2	NA 1	3 2	1 NA	1 1	6 8	.50 .44	.94
77	SS 181	30	22	G	NA –	1 –	NA –	NA –	2 –	1 NA	1 –	5 –	.42 –	.42
78	SS 189	30	22	G	NA –	1 –	NA –	NA –	2 –	1 NA	1 –	5 –	.42 –	.42
79	SS 245	43	48	OG	NA 1	1 1	NA 1	NA 1	2 1	1 NA	1 1	5 6	.42 .33	.75
80	SS 250	45	54	OG	NA 1	1 2	NA 1	NA 1	2 1	1 NA	1 1	5 7	.42 .39	.81
81	PL 1	4	9	OG	NA 3	1 1	NA 3	NA 1	3 3	1 NA	3 3	8 14	.67 .78	1.45
82	ST 16	4	10	OG	NA 3	1 1	NA 3	NA 1	3 3	1 NA	3 3	8 14	.67 .78	1.45
83	ST 25	7	18	OG	NA 3	1 1	NA 2	NA 1	3 2	1 NA	3 3	8 12	.67 .67	1.34
84	ST 33	6	12	OG	NA 3	1 1	NA 2	NA 1	3 2	1 NA	3 3	8 12	.67 .67	1.34

TABLE 40 (CON'T)

PROPOSED TRACTS 58A					ENVIRONMENTAL FACTORS							IMPACT		
					BIOLOGICAL				CULTURAL					
	Tract Lease Number	Distance from Shore (nautical miles)	Water Depth (meters)	Reserve	Littoral Systems	Reefal Systems	Other Benthic Systems	Endangered Species	Commercial Fishing	Shipping	Aesthetics	Cumulative Impact	Impact Index	Additive Impact
85	ST 170	30	29	G	NA –	1 –	NA –	NA –	2 –	1 NA	1 –	5 –	.42 –	.42
86	ST 220	41	48	OG	NA 1	1 2	NA 1	NA 1	2 1	1 NA	1 1	5 7	.42 .39	.81
87	ST 245	44	56	OG	NA 1	1 2	NA 1	NA 1	2 1	1 NA	1 1	5 7	.42 .39	.81
88	ST 270	47	64	G	NA –	1 –	NA –	NA –	2 –	1 NA	1 –	5 –	.42 –	.42
89	ST 300	54	108	O	NA –	2 –	NA –	NA –	2 –	1 NA	1 –	6 –	.50 –	.50
90	WD 34	10	24	OG	NA 2	1 1	NA 1	NA 1	2 1	1 NA	1 2	6 8	.50 .44	.94
91	WD 49	5	10	OG	NA 3	1 1	NA 3	NA 1	3 3	1 NA	3 3	8 14	.67 .78	1.45
92	WD 76	12	52	OG	NA 2	1 1	NA 1	NA 1	2 1	1 NA	2 2	6 8	.50 .44	.94
93	WD 86	6	56	OG	NA 3	1 1	NA 1	NA 1	2 1	1 NA	3 3	7 10	.58 .56	1.14
94	WD 107	7	68	OG	NA 3	1 1	NA 1	NA 1	2 1	2 NA	3 3	8 10	.67 .56	1.23
95	WD 118	23	58	OG	NA 1	1 1	NA 1	NA 1	2 1	1 NA	2 1	6 6	.50 .33	.83
96	SP 36	4	40	OG	NA 3	1 1	NA 1	NA 1	2 1	1 NA	3 3	7 10	.58 .56	1.14

TABLE 40 (CON'T)

PROPOSED TRACTS 58A					ENVIRONMENTAL FACTORS							IMPACT		
					BIOLOGICAL				CULTURAL					
Tract	Lease Number	Distance from Shore (nautical miles)	Water Depth (meters)	Reserve	Littoral Systems	Reefal Systems	Other Benthic Systems	Endangered Species	Commercial Fishing	Shipping	Aesthetics	Cumulative Impact	Impact Index	Additive Impact
97	SP 39	4	20	OG	NA 3	1 1	NA 2	NA 1	3 2	1 NA	3 3	8 12	.67 .67	1.34
98	SP 42	4	20	OG	NA 3	1 1	NA 2	NA 1	3 3	2 NA	3 3	9 12	.75 .67	1.42
99	SP 43	4	40	OG	NA 3	1 1	NA 1	NA 1	2 1	1 NA	3 3	7 10	.58 .56	1.14
100	SP 68	10	120	OG	NA 2	1 1	NA 1	NA 1	2 1	3 NA	2 2	8 8	.67 .44	1.11
101	SP 69	12	140	OG	NA 2	1 1	NA 1	NA 1	2 1	3 NA	2 2	8 8	.67 .44	1.11
102	SP 73	9	135	OG	NA 3	1 1	NA 1	NA 1	2 1	3 NA	3 3	9 10	.75 .56	1.31
103	MP 123	23	40	OG	NA 1	1 1	NA 1	NA 1	2 1	1 NA	1 1	5 6	.42 .33	.75
104	MP 143	17	60	O	NA 2	1 1	NA 1	NA 1	2 1	1 NA	1 2	5 8	.42 .44	.86
105	MP 145	21	65	O	NA 1	1 1	NA 1	NA 1	2 1	1 NA	1 1	5 6	.42 .33	.75
106	MP 303	17	73	O	NA 2	1 1	NA 1	NA 1	2 1	1 NA	1 1	5 8	.42 .44	.86
107	EB 305	27	175	G	NA –	1 –	NA –	NA –	2 –	2 NA	1 –	6 –	.50 –	.50
108	EB 306	29	190	G	NA –	1 –	NA –	NA –	2 –	3 NA	1 –	7 –	.58 –	.58

TABLE 40 (CONCLUDED)

PROPOSED TRACTS 58A				ENVIRONMENTAL FACTORS							IMPACT		
				BIOLOGICAL				CULTURAL					
Tract Lease Number	Distance from Shore (nautical miles)	Water Depth (meters)	Reserve	Littoral Systems	Reefal Systems	Other Benthic Systems	Endangered Species	Commercial Fishing	Shipping	Aesthetics	Cumulative Impact	Impact Index	Additive Impact
109 VK 989	22	350	OG	NA / 1	1 / 1	NA / 1	NA / 1	1 / 1	1 / NA	1 / 1	4 / 6	.33 / .33	.66
110 VK 990	29	425	OG	NA / 1	1 / 1	NA / 1	NA / 1	1 / 1	1 / NA	1 / 1	4 / 6	.33 / .33	.66
111 MC 27	23	425	OG	NA / 1	1 / 1	NA / 1	NA / 1	1 / 1	1 / NA	1 / 1	4 / 6	.33 / .33	.66
112 MC 28	25	500	OG	NA / 1	1 / 1	NA / 1	NA / 1	1 / 1	1 / NA	1 / 1	4 / 6	.33 / .33	.66
113 MC 531	37	325	G	NA / –	1 / –	NA / –	NA / –	1 / –	3 / NA	1 / –	6 / –	.50 / –	.50
114 MC 575	39	350	G	NA / –	1 / –	NA / –	NA / –	1 / –	3 / NA	1 / –	6 / –	.50 / –	.50
115 HI A-374	165	115	G	NA / –	3 / –	NA / –	NA / –	2 / –	1 / NA	1 / –	7 / –	.58 / –	.58

NOTES: RESERVES - OIL (O) GAS (G) OIL & GAS (OG)

LEASE BLOCKS

PS - SOUTH PADRE ISLAND
PN - NORTH PADRE ISLAND
MU - MUSTANG ISLAND
MI - MATAGORDA ISLAND
BA - BRAZOS
GA - GALVESTON
HI - HIGH ISLAND

WC - WEST CAMERON
EC - EAST CAMERON
VR - VERMILION
SM - SOUTH MARSH ISLAND
EI - EUGENE ISLAND
SS - SHIP SHOAL
PL - SOUTH PELTO

ST - SOUTH TIMBALIER
WD - WEST DELTA
SP - SOUTH PASS
MP - MAIN PASS
VK - VIOSCA KNOLL
MC --MISSISSIPPI CANYON
SL - SABINE (LA)
EB - EWING BANK

vicinity of each exploratory well by the presence of turbidity plumes created by the disposal of drill muds associated with the cuttings. If we assume that these operations create a plume 20 m wide and 800 m long (plumes of this approximate size have been observed in the Gulf of Mexico although occasionally plumes up to more than a mile in length have been observed) then the euphotic zone will be reduced under 16 ha of sea surface for the duration of drilling (approximately 15 days). The residence time for any single phytoplankton within this reduced euphotic zone would depend on the vertical and horizontal transport to which it is subjected.

The field development phase will have similar impacts only with longer duration. Assuming that a maximum of 60 wells would be drilled from each platform, approximately 400 drilling days would be necessary and the turbidity plume would be present during this period. This would result in a cumulative duration of 10,000 days for 25 platforms throughout the proposed sale area. This turbidity may reduce the photosynthetic assimilation of the total marine system in the proposed sale area by an amount that is presently unquantifiable.

The production phase can impact phytoplankton through the disposal of formation waters which contain the soluble fractions of crude oil at an average concentration of 30 mg/l and relict sea water with trace amounts of certain heavy metals. As mentioned above, the resultant receiving water concentration of petroleum hydrocarbons is difficult to assess, but if we assume instantaneous mixing into one cubic meter of sea water, the concentration would be approximately 30 micrograms per liter (ug/l). Gordon and Prouse (1973) have observed stimulation of phytoplankton photosynthesis by Venezuelan crude in concentrations of 30 to 50 mg/l with inhibitions at higher concentrations in studies conducted off Nova Scotia. Shields et al. (1973) found that very low concentrations of Prudhoe Bay crude stimulated Gulf of Alaska phytoplankton photosynthesis over short incubation period during December, April and June. The photosynthetic rate of June phytoplankton exposed to approximately 3 ug/l more than doubled the rate for phytoplankton in sea water containing no oil. Oppenheimer, et al. (1977) in their North Sea investigations found a tendency toward more organisms being associated with the most active oil fields. Mironov (1970), however, reports that cell division in phytoplankton was delayed or inhibited by crude oil concentrations as low as 1 ug/l. Thus minute petroleum hydrocarbon discharges from production phase may cause local stimulation of phytoplankton photosynthesis for the duration of production (approximately 20 years) in the immediate area of production platforms. But if excessive concentrations are discharged, a local inhibitory effect can be expected.

The anomalous ion rations present in formation water should cause minimal disturbance to phytoplankton due to dilution. Concentrations of trace metals contained in formation water may exceed background concentrations at the point of discharge.

However, Williams (1977) reports that his studies have shown that acute toxicity and much environmental degradation occur as a result of oil spills. He reports that the toxins are not from the oil itself but from ". . . apparently unsuspected high concentrations of some lipid soluble metals derived from the tolerant concentrations in the oceans". Williams further states that he found acute toxic effects on the nannoplankton downstream from oil rigs off Texas and Louisiana in 1975 and 1976 respectively. He does not, however, say how far downstream the effects are noted nor does he define "acute toxic effects". There is considerable controversy on this point, and the final word has not yet been written.

The transportation phase will affect the phytoplankton due to the pulse of turbid water created by pipeline burial operations. This pulse will temporarily stress phytoplankton in the immediate vicinity of the operations. If bottom areas high in heavy metals, pesticides, or other pollutants are traversed, the effects will be more severe and possibly of longer duration. Phytoplankton primary productivity will be temporarily impacted in an area approximately 50 meters wide throughout the length of the pipeline route.

Oil spills are always a possibility. Ray and Mills (1974) and Mills (1974) showed that phytoplankton exposed to water-soluble fractions of south Louisiana crude oil, Kuwait crude oil, No. 2 fuel oil, and Bunker C oil had reduced primary productivity. However, they noted that once the exposure to oil was terminated, the phytoplankton resumed a normal growth rate within a few days. They conclude that once a spill episode has passed, only a few cells need survive to repopulate a given area rapidly. Recruitment from nearby unaffected areas would also achieve a normal phytoplankton population quickly.

Our conclusion is that the plankton populations of the Gulf of Mexico ecosystem will probably be able to absorb the impact of a major oil spill and recover fairly rapidly. The greatest number of planktonic organisms directly killed from a spill greater than 50 barrels would be found in the neuston (the community in the upper five cm of the Gulf surface). Since annual biological productivity is greatest in spring and winter, especially along the coast in upwelling areas, a spill in this part of the year would do the most damage to phytoplankton productivity and standing crop.

Impact to planktonic organisms from chronic low-level discharges include direct lethality, reduction in photosynthetic efficiency, interference with chemical communication, and general physiological stress.

In summary, there is little doubt that phytoplankton will be adversely affected by the oil and gas activities that will result from this proposed sale, should it be held. However, even in the worst case of an oil spill, it is clear that such adverse effects will be limited to the immediate vicinity of the operation or spill, and will be of short duration. Thus small patches of phytoplankton may be killed by drilling operations or an oil spill, but such mortality will not significantly affect a species or even a population. Furthermore, once the affecting operation or substance is no longer present, it seems clear that phytoplankton populations in the area will quickly resume normality. Thus it is concluded that activities resulting from this proposed sale will have no significant nor lasting impact on phytoplankton.

There is a great deal of oil and gas activity taking place at the present time in the western and central Gulf as a result of previous sales. The cummulative impact on phytoplankton resulting from this activity added to the impact from this proposed sale is still believed to be insignificant, for reasons given above. Likewise, the added impact from any future sales than may be held is not considered to be significant, even though the location of this impact would move into deeper waters as operations move further from the coast.

2. Zooplankton

Much of the information regarding the impact of oil and gas operations on phytoplankton, discussed in the previous subsection, also apply to zooplankton.

Turbidity generated during the exploratory and development phases of OCS oil and gas operations may have an adverse effect on individual zooplankters in the immediate vicinity of the drilling rig. Zingula (1975) has shown that suspended solids concentrations in surface water near drilling discharges are of the order of 300 mg/l and are rapidly diluted to approximately 6 mg/l within 200 m of the discharge. An additional impact may be the temporary resuspension of bottom sediments during platform placement.

The dissolved components of crude oil present in production phase discharges may have a toxic effect on zooplankton in the immediate vicinity of the production platform. If we assume a local concentration of 30 parts per billion (ppb), direct lethality should not occur. However, Lee (1975) has shown that certain species of zooplankton can assimilate hydrocarbons from a seawater solution at low concentrations forming the necessary first step in food web concentration. Another potential effect involves the interference by petroleum hydrocarbons with chemically controlled behavior in zooplankton. The magnitude and importance of this potential impact is at present insufficiently known to allow prediction.

The use of pipelines in the transportation phase of OCS development should have a minor effect on the total zooplankton component of the marine ecosystem. Pipelaying may result in the temporary resuspension of bottom sediments and the resultant turbidity may have a severe effect on local zooplankton populations. In nearshore areas, the possibility of the liberation of adsorbed toxicants should be taken into consideration in pipeline routing since sufficient concentrations of heavy metals or chlorinated hydrocarbons to stress zooplankton may be present.

Important work by Mironov (1970) indicated that planktonic larvae of benthic and nektic animals (meroplankton) are more sensitive than permanent members of the plankton (holoplankton). Therefore, a threat to populations of various finfish and and shell fish exists for oil prone areas.

In addition, coating by oil of various plankton species (i.e., large coelenterates) could have an adverse effect. Neuston (strictly surface dwelling plankton) are clearly threatened. However, active vertical migrators, in a worst case assumption, are also potentially threatened.

Like the impact on phytoplankton, the impact on zooplankton will be local and short term. Also like the phytoplankton, past and proposed future Gulf sales will not add to the impact, but will only maintain a more or less constant level, even though the location of the impact may change.

3. Nekton

With the use of non-explosive energy sources for seismic survey work, the pre-exploratory phase of oil and gas development should have minimal impact on the marine nekton. Faulk and Lawrence (1973) report that while explosive sources killed fish over an area of thousands of square feet, the nonexplosive source tested caused no direct mortality. Weaver and Weinhold (1972) reported no harmful effects from nonexplosive sources fixed at various depths. Explosive energy sources are still used for special applications approximately eight times per year in the Gulf of Mexico. The environmental impact of this limited use is considered to be insignificant.

The exploratory phase will have a localized temporary effect on the nekton due to the physical presence of the rig and the disposal of drill muds and cuttings during the drilling of exploratory wells. The attraction of nektonic organisms, especially fish, to submerged structures is a widely recognized phenomenon and since drilling rigs are well lighted, this attraction may be enhanced at night. Observations in the Gulf of Mexico indicate that fish are also attracted to the drill cuttings as they cascade down through the water column where they may be sampled as food items and rejected. No definite bioassays have been conducted with drill muds and species found in the proposed sale area, however, Faulk and Lawrence (1973) have indicated lethal concentrations of between 0.83 and 12.0 percent of drill mud with lake chub and rainbow trout. Experience in the heavily developed areas of the Gulf of Mexico indicates that no severe adverse effects upon nektonic populations will result from exploratory drilling.

In the first year's findings of the Buccaneer Field Study off Galveston, Texas (NMFS, 1977) the highest macrocrustacean and demersal fish catch were found in the near vicinity of the platforms. Concentrations of brown shrimp were found near the structures.

The data indicates that the oil field structures act as artificial reefs and fish utilize this area for spawning, feeding and shelter. The study of the fouling community resulted in evidence that the larvae of the fouling invertebrates make a large contribution to the food of nektonic invertebrates and planktivorous fishes. Ichthyoplankton abundance was greatest around the platforms.

Trace metal analyses of organisms including fish, shrimp, squid, plankton and barnacles, showed concentrations of normal levels with exception of Cd and Sr in barnacles. Some of the barnacle specimens had concentrations of Sr (up to 100 ppm) and Cd (up to 100 ppm).

Middleditch (NMFS, 1977) summarized the hydrocarbon analyses: "The alkane concentration of the discharged brine ranges up to 9 ppm. There is evidence for petroleum-derived n-alkanes (up to 35 ppb) in surface-seawater samples, but alkanes in bottom-water samples may be of bacterial origin. It is possible, however, that the presence of these bacteria may be due to sulfur discharges from the production platforms. Flesh from subsurface barnacles is free of petroleum, but there is evidence of petroleum alkanes in some flesh samples of specimens collected at the surface. Most barnacle shell samples (from which attached organisms were not removed) also appeared to contain petroleum-derived alkanes. Of four species of shrimp examined, only one was found to contain petroleum alkanes. Inconclusive results were obtained for plankton, and no petroleum was found in squid or sediments."

The field development phase will entail the installation of semi-permanent platforms from which development wells will be drilled. The platforms, like the drilling rigs, will attract the larger organisms immediately; but due to their permanent nature, they also act as true artificial reefs with the establishment of a community of great diversity.

The production phase of offshore operations can impact the nekton through the disposal of formation waters which contain the soluble components of crude oil (30 mg/l) and trace amounts of certain heavy metals. The effects of these low-level chronic discharges are not quantifiable at present. However, due to the magnitude of dilution and the process of microbial degradation, no adverse effects upon nektonic populations have been noted in areas of intense oil and gas development in the Gulf.

The transportation phase, if by pipeline, will result in temporary, localized increases in pipelaying operations which can be easily avoided by the actively swimming nekton. No long term nor incremental adverse impacts are expected to occur to the nekton.

4. Benthos

The exploratory phase effluents that may be expected to have an effect upon benthic organisms include drill cuttings and drilling muds.

The sessile benthic organisms upon which the cuttings pile will accumulate, will be buried by approximately 641 yd of cuttings generated per exploratory well. The projected number of exploratory wells that this proposal would generate is: high estimate, 160 wells; mean, 110 wells. This would mean that 70,510-102,560 yd^3 of cuttings would be dumped into the western Gulf over the life of the field. These cuttings may form a low mound or may be worked into the surrounding sediments. Their disposition is dependent upon the nature of the cuttings, the nature of the local sediments, the depth of disposal, the benthic fauna capable of bioturbation and/or encrustation, and the physical forces acting upon the cuttings pile.

The drilling muds which are associated with the cuttings when they are disposed of overboard, are washed from the cuttings and eventually settle to the bottom after generally a wide dispersal through the water column. Also, muds are routinely discharged into the water during drilling operations as mud mixtures are changed, and, at the completion of drilling operations, some 800 barrels of mud are discharged (Otteman, 1976). The major impact of these discharges would be the smothering of benthic organisms in a small area immediately adjacent to the drilling platform. Experience in the Gulf of Mexico indicates that such effects are of short duration in a small area, and that there is no long term impact (Zingula, 1975). Jones and Williams (1973) found sediment barium concentrations to be above normal in areas of the Gulf of Mexico where intensive drilling has taken place. Barium sulfate is the major constituent of drilling fluids and the distribution of barium in the sediments suggest that the above-normal concentrations are due to the disposal of these fluids. Barium sulfate is a highly insoluble, nontoxic salt which is present in seawater at a concentration of approximately 0.05 mg/l and in certain localities concretions and nodules of barium sulfate are found naturally in bottom deposits. (Horne, 1969). As indicated by bioassay data, the toxicity of a typical mud would be due principally to the dissolved lignosulfonate thinner; however, rapid dispersion and dilution quickly lower the concentrations below toxic levels. Therefore, no direct toxic effects on benthic biota are expected from the disposal of drilling fluids during the exploratory and development phases. The U.S. Environmental Protection Agency is presently conducting research which addresses the problem of drill mud toxicity to marine organisms, and BLM is continuing research into the ultimate fate of the muds.

In the Buccaneer Field Study (NMFS, 1977) benthic meio- and macrofauna populations were studied as well as hydrocarbons and trace metals. Both benthic meiofauna and macrofauna were found to be depressed around the platforms and a zone of enrichment was found 1000-2000 m away from the platforms. There was no readily apparent relationship between the macro- and meiofauna.

However, as noted in the previous section (Nekton), elevated macrocrustacean and demersal fish populations were found around the platforms. This might indicate some degree of independence between benthic and nektonic system.

As previously mentioned, trace metals were normal in most organisms except for barnacles which appeared to accumulate Cd and Sr. The trace metal concentrations for the bottom sediments showed enriched concentrations of Pb, Zn, and Sr near the platforms. The hydrocarbon analyses results were somewhat inconclusive, however, flesh from barnacles collected at the water surface had evidence of petroleum alkanes, whereas those collected from sub-surface locations did not. The shells of the barnacles contained evidences of petroleum-derived alkanes. Bacterial origin for these hydrocarbons has not been ruled out. No petroleum was found in the sediments.

The field development phase will require the placement of platforms and the drilling of up to 150 wells among a maximum of 25 platforms. The initial platform placement and anchoring may temporarily disturb the benthic biota in the immediate vicinity. Longer term effects may include a change in the benthic community to reflect the presence of an artificial reef.

The drilling of 20 wells from a platform will result in the disposal of approximately 8,440 yd^3 of cuttings which, in this area, are expected to be mainly clastic in nature. This may result in the establishment of a different benthic community in the immediate vicinity of the cuttings pile.

The production phase will result in the introduction of the soluble components of crude oil at an average concentration of 30 mg/l. If these components become adsorbed to suspended particulates they may eventually be incorporated into the benthic environment. This will cause a shift in the sediment microflora to a community capable of utilizing petroleum hydrocarbons as an energy source. Those compounds which are not degraded may accumulate in the deeper sediment layers. To date, no investigation that would determine if this is the case has been conducted in areas of offshore petroleum development.

If the transportation phase requires the installation of pipelines, certain impacts to the marine benthos will occur. In water depths of less than 61 m, new pipelines are entrenched by jetting away the sediment beneath the pipe and allowing the pipe to settle approximately one meter into the underlying trench. Partial burial takes place quite rapidly as the disturbed sediments slide and settle back into the trench.

The jetting process physically disrupts the sediments in its path, and also causes resuspension of large quantities of sediment. This process would have the effect of displacing benthic organisms and would result in direct mortality to softer life forms and indirect mortality to others through increased vulnerability to predators. Although recolonization would begin immediately, the native fauna could not be fully restored until seasonal reproduction cycles had been completed by representative species from adjacent areas; these would provide a supply of larvae to settle and enter the reworked substrate.

Turbidity resulting from resuspended sediment is capable of producing an adverse impact on filter-feeding molluscan and crustacean benthos populations by clogging the filter-feeding apparatus or blocking respiratory surfaces. This impact is temporary, occurring during burial operations, lasting from several hours to a few days, and would affect those populations adjacent to the pipeline. Observations indicate that ocean currents carry the sediment and redeposit it at various distances, depending upon the particle size of the sediment. Moreover, these same factors along with the rate of burial operation determine the length of time in suspension.

The expected length of pipeline from this proposed sale is 100–200 miles. Locations of these pipelines are presently unknown. It is expected that the area impacted would be localized within 50 m of the particular operations throughout the water column. However, this area may decrease or increase because of the following variables: water currents, sea conditions, water depths, natural bottom sediment, and dispersion rate of bottom sediments from jetting operation.

Recovery rates would be dependent upon seasonal reproduction cycles and recolonization by indigenous and other species. Estimates for recolonization range from months to several years.

Thus it is believed that while drilling activities will have a severe effect on benthic organisms in the immediate vicinity of the activities, such as around platforms and pipelines, the overall impact on the benthos from this proposed sale will not be of any wide spread or long term significance, nor will the cumulative impact of previous and future sales be of any significance. The extremely small portions of the benthos affected would not impact Gulf benthic populations.

5. Beaches and Barrier Islands

Beaches

No new pipelines are projected to be brought ashore as a result of this proposed sale unless production occurs in an area remote from existing pipelines. Tracts 1–4 in the South Texas OCS, for example, are isolated from currently producing hydrocarbon zones. Should these gas prone tracts be leased and commercial discoveries result, it is probable a new transmission pipeline will be required for the gas to reach onshore processing facilities. The closest existing onshore gas processing plants in South Texas are in the Brownsville and Corpus Christi areas; therefore, it is logical to assume a transmission line constructed for gas production in the vicinity of tracts 14 would come ashore either to the north or south of Padre Island National Seashore. Any pipeline landfall in South Texas is likely to cross and impact a public beach, wetlands and upland areas.

As a pipeline approaches the beach, there is a transition from burial by jetting to burial by dredge, either bucket, clamshell, or suction dredge. As this operation crosses the beach, it will disrupt and rework the sand for a width of 10 to 15 m, possibly killing the indigenous beach fauna. At least one year will be required for the disturbed intertidal zone to return to normal.

Above the high-tide line, devegetation will occur along the pipeline right-of-way. Small dunes appear to recover within a few years after the installation of pipelines. Large, primary dunes will require much more time. These processes of dune reconstruction can be accelerated by planting of dune vegetation, such that dune communities can be expected to recover within a few years to soil, plant and animal conditions similar to an undisturbed, small dune (Willingham, et al., 1975).

6. Wetlands

Wetlands can be affected as a result of this proposed sale by pipeline construction and large oil spills. Since little, if any, new construction will result from this proposal, little impact to wetlands from construction is anticipated.

There is a probability in South Texas, however, that tracts 1-4 may be leased and result in commercial production of gas. Should this occur, a new transmission line would ensue and wetlands between the beach shoreline and the onshore processing facilities in the vicinity of either Brownsville or Corpus Christi are likely to be affected.

Oil spills, particularly those which occur in or near wetland areas during the transportation of oil to shore, can have a severe and long-lasting impact on wetlands. Most oil spills are small and affect localized areas and probably have little effect.

The possibility of a large, damaging spill is certainly present but is unquantifiable. There has been no oil spill risk analysis nor a spill trajectory analysis performed for this proposed sale; without such analyses it is impossible to predict where and how much oil from a spill is likely to come ashore. It is clear that oil changes ecosystem relationships in wetlands, but it appears that recovery eventually takes place (Cairns, et al., 1977).

The extensive wetlands of Louisiana have been subjected to a large amount of a wide variety of oil and gas exploration and development activities for some forty years. While it is clear that dredging for pipeline and canal construction has a severe impact on wetland ecology (Gagliano, et al., 1972), the effects of long term, low level, chronic oil pollution on such areas is not at all clear. Others disagree and have stated there may be no significant effect at all (St. Amant, 1973).

Therefore, it is concluded that since oil and gas discovered as a result of this proposed sale will, for the most part, replace existing supplies rather than add to them, and since little, if any, construction in the wetlands will result from this proposed sale, there will be no significant adverse effects on wetlands from construction activities; a large oil spill, however, during the transportation of oil from offshore, which reaches a wetlands area within a few days, may have a severe effect on such an area (Cairns, et al., 1977). Unfortunately, no prediction can be made as to the likelihood of such a spill, but long experience of oil and gas operations in the Gulf of Mexico would seem to indicate that such an occurrence is unlikely. Furthermore, the increment of such risks to past sales, and indeed to any future sales, presented by this proposal is not considered to be significant.

7. Biologically Sensitive Areas

Areas of high biological productivity and areas which are biologically unique on the OCS can suffer severe impacts if oil and gas operations are permitted on or very close to them. In general, such areas are located in deep clear waters near the shelf break, and are physically expressed as topographic features which rise out of the deeper water to shallow enough depths to support the growth of plants, corals, and other typical ''Caribbean Reef'' organisms (Bright et al., 1976, and section II.B.10.). Adverse impacts to these areas can include mechanical damage due to anchors, rig and platform placement, the actual drilling operation itself, and the laying of pipelines; and damage by smothering, turbidity, or toxicity due to drilling fluids (''muds'') and cuttings (section III.A.1.). Because of the depths of water involved (even the East Flower Garden Banks has depths no shallower than 18 m (60 ft)) it is believed that an oil spill will have little if any impact on these banks.

In order to eliminate these impacts and to protect the biota of the banks, BLM, in consultation with the USGS and the USFWS, has developed lease stipulations which are included in the lease document for any leased block located on or near a bank deemed to be unique or productive. Five blocks near five banks are included in this proposed sale: Tract 58A-20 near Stetson Bank, Tract 58A-37 near Bright Bank, Tract 58A-89 near an unnamed bank in Block 317 of the South Timbalier Area, South Extension, Tract 58A-115 near East Flower Garden Bank, and Tract 58A-118 near West Flower Garden Bank. Essentially these stipulations prevent any oil and gas activity on the banks themselves and require shunting of fluids and cuttings and/or monitoring of the effects of the activity on the biota for activities up to 5.486 km (3 miles) from the bank. Such monitoring and other BLM studies have indicated that the requirements of these stipulations are working to protect the biota of the banks (Bright et al., 1976).

Since these stipulations will be included in the leases of those five tracts should they be leased, it is believed that this proposal will have no impact on these biologically sensitive areas, and that there will be no incremental impacts due to past or future lease sales.

8. Birds

Bird kills were reported following the Torrey Canyon spill in southwest England (Smith, 1968); the Santa Barbara spill in California (Straughan, 1971); and the San Francisco Bay spill in California (Chan, 1972). Causes of death include: 1) disruption of feather surfaces leading to either drowning as a result of the loss of buoyancy, or pneumonia as a result of the loss of thermal insulation; 2) ingestion of toxic oil droplets from excessive preening; and 3) ''accelerated starvation'' as a result of increased metabolic activity (to compensate for loss of body heat) coupled with a decrease in feeding (Boesch et al., 1974).

Another possible effect on bird species could be reproductive in nature. Mallard ducks fed diets containing 2.5 percent South Louisiana crude oil for a six month period produced 50 percent fewer eggs than controls. Five microliters (0.1 ppm) of crude oil applied to the surface of mallard eggs, reduced hatching by 26 percent to 90 percent. Crude oil weathered outside four weeks decreased in toxicity, but 20 microliters applied to mallard eggs caused 50 percent embryonic mortality (USDI-FWS, 1977). This information suggests that oil pollution could seriously affect marine and estuarine bird populations by transfer of oil from the plumage of incubating birds to their eggs.

Aumann (1977) in his research in the Buccaneer Field Study off Galveston, Texas reported:

> ''On the basis of one year's data it is reasonable to conclude that the effect of structures on migratory marine birds is negligible. The effect on resident marine birds is beneficial in providing food and resting areas. The effect on migratory birds could be detrimental, but will require further study to warrant definite conclusions.''

Diving ducks and pelicans that dive into water to collect food are more susceptible of contacting oil slicks. These species are usually gregarious, and there could be a potential for small local populations to be lost as a group.

A maximum of two onshore terminal storage facilities may be constructed as a result of this proposal. There could be adverse impacts to bird habitat and food sources as a result of onshore construction. The severity of habitat/food loss would be determined by the type and location of the onshore construction; however, this information is not available at this time.

Adverse impacts on shore birds (plovers, gulls, etc.), pelagic birds (terns, shearwaters, etc.) and other waterfowl (teal, mottled duck, scaup, etc.) can take several forms: 1) destruction of nesting habitats; 2) destruction or contamination of food; and 3) direct mortality from ingesting or being coated with oil. Therefore, all of the proposed oil prone tracts would present some degree of adverse impact. Four tracts (44, 81, 82 and 91), present a high potential impact and nineteen tracts (63-68, 83, 84, 90, 92-94 and 96-102) present a moderate potential impact of oil spills contaminating the habitat, food, or individuals of these species. These tracts are either gas or oil prone tracts. Therefore the possibility exists an oil spill occurring if oil production proceeds in these tracts. These tracts are located from 6 to 202 km offshore. If an oil spill should occur and drift shoreward there is a possibility of oil contamination of bird habitat, food sources, and individual birds diving into oil slicks while feeding. The tract locations are keyed to the matrix analysis (Appendix E) and Visual No. 3 to indicate the potential impact of each tract to these bird species.

In summary the major impact on birds as a result of this proposal will be as the result of oil spills on diving species which become coated with oil and expire. Past (and proposed future) oil and gas development in the Gulf of Mexico region has, and in the future will probably have, an adverse cumulative impact on bird species as a result of habitat destruction from onshore construction and oil contamination of food species and individual birds.

9. Marine Mammals

There are about 24 species of marine mammals including five endangered species (sei, fin, blue, right and sperm whales) which occur in the central and western Gulf of Mexico. The bottlenose and Atlantic spotted dolphins and the sperm and short-finned pilot whales are the most common marine mammals sighted in this region. However, there is little information on the population dynamics and migration behavior of the majority of marine mammals in this region.

Oil and gas development in this region as a result of this proposal may affect marine mammals as a result of oil spills, and increased marine traffic. The direct effects of oiling on marine mammals could include: the irritation of skin and eyes; internal disorders caused by the ingestion of oil; possible clogging or inflammation of respiratory passages; and fouling of baleen plates, thus impairing the feeding efficiency of baleen whales. A potential danger to cetaceans is the absorption of oil through the mucous membrane which lines the blow hole distal to the nasal plug. The danger exists because this area remains open near the surface of the water and may become oiled. This could result in a thin film of oil covering the lungs and respiratory passages which would have the same effect as pneumonia and could cause death.

Increased marine traffic (drilling vessels, crew boats, barges, and/or tankers) could disrupt feeding and/or migration behavior. Marine traffic collisions involving marine mammals could occur. Detailed descriptions of the kinds, amount, and location of marine traffic expected to result from this proposed action is not available at this time.

Secondary impacts may include contamination, redistribution or a decrease in food supplies. Ingestion of contaminated organisms as a result of an oil spill incident could occur. Young marine mammals might also ingest oil during their period of nursing. Effects of oil fouling, on reproduction are unknown for marine mammals. As marine mammals forage for such organisms as copepods, euphausiids, squid, and fish, localized decreases or redistributions of these organisms as a result of oil and gas operations in this region could limit food available. These secondary impacts cannot be assessed until more specific development data is available.

Discrete populations of marine mammals (e.g., bottlenose dolphin in this region) might directly or indirectly be affected by activities associated with this proposed action (i.e., oil spills and/or marine traffic). During periods of high tide, bottlenose dolphins move into shallow bays and sloughs for feeding and would be more susceptible to the effects of oil at this time.

Because of the endangered status of some marine mammals, and their apparent limited distribution or occurrence in the Gulf of Mexico, any impact to individual marine mammals could have consequences on their populations or distribution.

Critical assessment of reports of oil contamination of marine mammals show that there is little if any solid evidence linking reported mortalities to the presence of oil. There is no evidence as yet to show how oil fouling affects these animals and the difficulties involved in conducting controlled experiments on the larger animals, such as whales, may actually preclude such studies (Garibaldi, et al., 1976). There is no evidence to indicate any previous impact to marine mammals as a result of previous oil and gas lease sales in this region.

In conclusion, there will be a minimal, if any, adverse impact to marine mammals in the central and western Gulf of Mexico as a result of this proposal.

10. Marine Turtles

Four marine turtle species, the Kemp's Ridley, the leatherback, the loggerhead, and the green inhabit the central and western Gulf of Mexico.

Adult loggerheads seem to be attracted to ''treelike'' platforms offshore. Ogren (1976) has observed them sleeping under offshore platforms off Panama City, Florida. They probably use the platforms for feeding and resting areas. Turtles in the vicinity of platforms would be vulnerable to both oil spills and possible collision with boats.

If an oil spill coated a marine turtle nesting beach during the late spring through summer, the turtles might avoid the beach entirely. Indeterminate turtle mortality could occur if a nesting beach became oiled during the approximately two month incubation period. Death of egg embryos could occur through asphyxiation without oil contacting the eggs should the sand be covered with oil. Clean-up activities could destroy nests or compact the sand over the nests such that hatchlings would be unable to dig out.

Turtle hatchlings are especially susceptible to oiling during the first 7 to 14 months of development while they are pelagic in habits and prior to moving inshore to take up benthic habits (except the leatherback). During this period, they are frequently observed associated with mats of sargassum weed (Smith, 1968; Caldwell, 1969). Passive transport by ocean currents is the main dispersal mechanism for these turtles and is the same type of movement expected of oil spilled in an offshore area. Turtles surface at one to three minute intervals when actively swimming and at least 30-40 minute intervals when resting. They are, therefore, very vulnerable to oiling during an oil spill in their vicinity.

Hatchlings are disoriented by lights according to McFarlane (1963). Lights on the beach or at sea can affect turtles in their post-natal drive to reach open water and favorable currents. Therefore, refineries, docks, offshore platforms and gas flaring would be expected to attract or disorient the hatchlings. In addition to lighted offshore platforms or gas flaring disorienting hatchlings, they would be susceptible to mortality by predatory fishes attracted to the structure.

The impact of oil and gas operations on marine turtles and their habitat have not been studied and therefore are difficult to evaluate. However, the endangered and/or threatened species status is an indication that any unnatural loss of marine turtles should be prevented.

Visual No. 3 and Appendix E indicate that this proposal will have a minimal potential for oil spill impact on marine turtles in this area. The cumulative impact of past and proposed future oil and gas lease sales on marine turtles is a negative impact to an unknown degree.

11. Other Wildlife

Direct impact on terrestrial wildlife could occur through habitat encroachment and oil spills, and secondary impacts through potential oil spill contamination of food.

Direct impacts resulting from construction as a result of this proposal would be the greatest on the small animals, reptiles, and amphibians at construction sites. It is estimated that up to 480 ha will be required for a maximum of two onshore storage facilities. The locations of these facilities have not been determined, but probably they will be in areas which are already developed and thus will have a minimal impact on wildlife.

Pipeline construction would affect wildlife habitat by alteration. The extent of the affects are dependent upon the size of the area affected and time for recovery and revegetation. The only areas where new pipelines are likely to come ashore is in South Texas in the vicinity of Brownsville or Corpus Christi. Such a line would most likely be a major gas transmission line (36 inch diameter) between the South Texas OCS lease-production areas and existing onshore processing facilities. Those individual animals having home ranges within or overlapping the zone of construction would be either destroyed or displaced and there would be a negative affect on their habitat.

Disturbance due to local construction should have only a local and minor impact. This means that there should be little measurable indirect impact on the total system stemming from impact on small animals. It is possible that a population occupying a small area could be eliminated, causing a greater adverse indirect impact, but no such populations have been identified.

There could be direct, adverse, short-term impact on small animals (mammals, reptiles, and amphibians) anywhere that an oil spill reached shore or occurred onshore. The impact would depend on the location, the habitat, and the season of the year. It might range from minute to severe depending on the circumstances. There is insufficient information available to evaluate the long-term and indirect effects of oil spills upon small mammals. Shore areas most susceptible to spills would be along pipeline and tanker routes.

Through beach and marsh vegetation and carrion links in the food web, it is possible that oil production could affect terrestrial mammals which either constantly or intermittently use habitats subject to oil pollution. Intermittently, deer and other foragers and rodents utilize beach and intertidal zone plants exclusively and would thus be vulnerable to the threat. Ingestion of oil-covered carrion by foxes, skunks, and shrews would result in petroleum hydrocarbons being assimilated directly at the top of the food chain; however, the relative toxicity of crude oil to these mammals is not currently known.

The impact on beach-utilizing mammals of hydrocarbons that have become entrained in the marine ecosystems from chronic low-level sources is unknown.

There could be an indirect negative impact on the small population of marsh white-tailed deer which inhabit the Mississippi delta marshes from any habitat encroachment or destruction.

There could be direct negative impacts on furbearers (nutria, muskrat, and raccoon) in the central Gulf of Mexico coastal marshes. An oil spill could result in the loss of marsh habitat and food species (vegetation, crustaceans, etc.) to the furbearer population. The insulating properties of the fur would be destroyed upon coating with oil and could result in illness or death of these species.

In conclusion the major impacts on other wildlife species as a result of this proposal will be two pronged. An indirect adverse impact to species populations as a result of possible habitat and food loss and a direct impact to individuals which succumb as a result of ingesting or being coated with oil.

Also indirect cumulative impacts to these wildlife species has occurred and probably will continue to occur from past and proposed future OCS oil and gas operations as a result of coastal habitat encroachment and destruction. The amount of this specific habitat destruction is difficult to quantify.

12. Threatened and Endangered Species

Possible impacts on endangered whale species as a result of this proposal are discussed in Section III.B.9.

There probably will not be a direct negative impact on the endangered red wolf population in southeast Texas and southwest Louisiana (Visual No. 3) as a result of this proposed sale. Because only a maximum of two onshore facilities are anticipated as a result of this proposal and the proposed offshore tracts in this area are all gas prone. The matrix analysis indicates a minimal potential impact from these proposed offshore tracts.

There should not be an adverse impact on the sandhill crane population in Jackson County, MS. The designation of a critical habitat for the sandhill crane will protect this area from onshore construction.

The proposed tracts located offshore from whooping crane, peregrine falcon, and Attwater's prairie chicken habitat are indicated to be gas prone and therefore have a minimal potential oil spill risk.

Four proposed tracts (44, 81, 82 and 91) present a potential maximum impact and nineteen tracts (63-68, 83, 84, 90, 92-94 and 96-102) present a potential moderate impact for oil contamination of food near bald eagle nesting areas (Visual No. 3).

Tract 83 is an oil and gas prone tract located about 38 km south of the brown pelican nesting area on Queen Bess and Grand Terre Islands, the only brown pelican nesting area in Louisiana. This tract presents a minimal potential impact from oil contamination of habitat, food, and individual brown pelicans. Brown pelicans could be coated with oil while diving for food fish, if any oil spills occur within their feeding range. The habitats of the other endangered and threatened birds species are not within the probable area of impact as a result of this proposal. Section III.B.8. contains additional discussion of impacts on birds.

It is estimated that the highest concentration of American alligators in the central Gulf of Mexico occurs in the freshwater coastal marshes and swamps of southwestern Louisiana. Alligators are seldom found in marshes where water salinity exceeds 10 ppt. Therefore, saltwater intrusion caused by onshore construction (dredging for canals, roads, etc.) will result in the loss of alligator habitat. The ingestion of oil coated food (nutria, waterfowl, etc.) by alligators is probable, though possible ill effects have not been determined.

A maximum of two onshore facilities are anticipated as a result of this proposal. The matrix analysis indicates that four tracts (44, 81, 82 and 91) may have a high potential impact and nineteen tracts (63-68, 83, 84, 90, 92-94 and 96-102) may have a moderate potential impact on the habitat and food species of the alligator and probably on the alligator population.

Little, if any, of the habitat utilized by these species or other endangered species is expected to be lost as a result of this proposal. Most of the onshore operations will be restricted to very small areas. Little habitat of any type is expected to be lost to permanent installations (a maximum of 480 ha). No direct relationship establishing a reduction of endangered species habitat is demonstrable at this time.

Formal consultation under Section 7 of the Endangered and Threatened Species Act was held

April 4-6, 1978, with the Fish and Wildlife Service and National Marine Fisheries Service pertaining to Proposed Sale 58. In the biological opinion of these agencies, Proposed Sale 58, subject to certain conditions, will not jeopardize the continued existence of the Threatened or Endangered Species considered during the consultation, or result in destruction or modification of critical habitats or habitats likely to be determined as critical in the future.

A formal endangered species consultation to include the Gulf of Mexico region has been requested of FWS and NMFS. During the interim period the biological opinions for Proposed Sale 58 will be used for Proposed Sale 58A as the same species and region are included in both proposals.

13. Estuaries and Embayments

The estuaries of the states of the Gulf coast are highly productive ecosystems. Detrimental effects upon the primary productivity of these ecosystems would result in a decrease in the planktonic food supply of the menhaden, shrimp, and other fisheries in addition to direct toxic effects of crude petroleum on other fauna and flora. Ketchum (1973) cautions that while effects of petroleum depend upon proximity to and type of oil released, "Any release of oil into the environment carries a threat of destruction and constitutes a danger to world fisheries".

However, other authors believe the adverse effects of petroleum hydrocarbons on the biotic communities of the Gulf Coast are less significant. St. Amant (1973), speaking of the oil producing structures in the bays, offshore areas, estuaries, and marshes of his state says:

> "Louisiana's coastal areas with more than 25,000 producing wells, with some fields that have been in production for more than 40 years, and most of which has existed for 20 years, serves as a type area of high production and long-term pollution."

Yet St. Amant, aware of possible environmental damage which may result from ". . . chronic mismanagement of the environment . . .", states:

> "Long-term exposure in Louisiana does not seem to have resulted in significant changes in the biotic productivity of the marine system and the presence of normally occurring hydrocarbons at levels of from 100 to 500 ppm. in bottom mud tend to confuse attempts to determine accumulative levels of petroleum hydrocarbons in the substrate."

While studies cited previously in this section indicate the retarding effect of petroleum on primary productivity, it is St. Amant's opinion based on his experience that there has been no decrease in overall productivity in Louisiana resulting from introduction of crude oils into the ecosystem (St. Amant, 1973).

The presence of oil consuming microbes which consume limited amounts of hydrocarbons as documented for Barataria Bay, Louisiana (Stone, 1972) may partially account for the reported lack of environmental damage.

Onuf (1973) studied the effects of petroleum in the field near refinery effluents, natural seeps and drilling operations and in the laboratory. He cites a study of Spears (1971) in which the biological effects of oil production upon estuarine organisms were considered. In the study, Spears compared the yield of harvestable organisms from waters receiving oil field wastes in Texas with nearby waters which were relatively unaffected by human activity and concluded that there was a serious detrimental effect to commercially important organisms due to oil field wastes. However, the high concentration of oil in the creek under study (16 ppm) and the effects of brine effluents concludes that ". . . demonstrable effects of long term pollution by oil are very local and often associated with concentrations that approach acutely toxic levels. Where more general effects have been suggested, confounding factors have not been satisfactorily discriminated". According to Onuf:

> "The fact that a long period of large scale oil extracting activities has not reduced the productivity of major fisheries along the Gulf Coast of Louisiana suggests that many populations in offshore regions can accommodate long term, low level intrusions of oil. The case for estuaries cannot be so succinctly stated nor dismissed. No respectable field experiments (on estuaries) have been reported."

Onuf points out that lab experiments have revealed ". . . dislocations of normal behavior . . ." by organisms in concentrations of oil found in some polluted estuaries and that adverse synergistic interactions between low concentrations of oil and temperature/salinity stresses are of such dangerous magnitude that they warrant direct testing by field experiments. He feels that refinery effluents cause more environmental harm than drilling operations, although he maintains that no predictions are possible on how serious the damage may be.

Galtsoff (1959) noted that the major effects of industrial wastes and the soluble components of crude oil on oysters is a reduction in the rate of various physiological functions, principally ventilation of the gills. Specifically, these pollutants cause a reduction in the amount of time during which an oyster opens its valves for feeding and respiration, and also interferes with the coordination of the ciliary motion with the result that the pumping capacity of the gills is reduced. The reduction in feeding time (simultaneous with respiration) results in a lowered growth rate and poorer quality oyster meats. It is well known that oysters can become contaminated with oil. (Ehrhardt, 1972; Galtsoff, 1959; Mackin and Sparks, 1962) but there is still scientific debate as to whether oysters can cleanse when returned to clean water.

Stegeman and Teal (1963) exposed two oyster populations, differing in fat (lipid) content, to oil and found that petroleum hydrocarbons were accumulated by both groups of oysters. The oysters with a higher lipid content collected the greater wet weight of hydrocarbons. Hydrocarbons accumulated were rapidly, although incompletely, discharged when the oysters were transferred to an uncontaminated system. These researchers also found that the petroleum contained in the oysters differed from the contaminating oil by showing a greater percentage of aromatics. This result suggested that a higher percentage of aromatic fractions of oil were more likely to be incorporated into the oyster's tissue. The possibility that the oysters were themselves modifying the oil could not be discounted, however.

In summary, while current research indicates the potential hazards of chronic hydrocarbon addition to the estuarine environment, field observations in Louisiana do not indicate that chronic pollution has reduced overall productivity. Should this proposed sale be held it is possible that oil spills which could result from exploration development and transportation of petroleum from leased tracts may have some adverse effect on the estuarine areas of Louisiana and Texas.

14. The Marine Food Web

Some concern has been expressed as to the possibility of food web magnification of petroleum hydrocarbons in marine ecosystems; that is, an increasing concentration of hydrocarbons per weight of tissue at succesively higher levels of feeding. This phenomenon has been observed in birds with respect to chlorinated hydrocarbons such as DDT. However, partitioning across respiratory surfaces is considered to be the most likely means of uptake and release of hydrocarbons in marine organisms. The National Academy of Sciences has concluded that there is no evidence for food web magnification in the case of petroleum hydrocarbons in the marine environment; and that, on the contrary, evidence is strongest that direct uptake from the water or sediments is more important than from the food chain, except in special cases (NAS, 1975). Appendix F presents a complete review of the influence of petroleum hydrocarbons and heavy metals on marine food webs.

The NAS (1975) concluded that modest concern appeared to be justified regarding the effects of oil in the marine environment on human health. Although it is known that petroleum contains small amounts of carcinogens and possibly small amounts of other harmful materials, the amounts of carcinogens known to be in petroleum that could be ingested by eating marine organisms is estimated to be no greater than that acquired from eating any other foods.

C. Physical Environment

1. Seabottoms

a. The Gulf Seafloor

Impacts to the seafloor resulting from this proposed sale would be in the form of physical disturbances resulting from construction activities. There are 10 to 25 platforms, and 100 to 200 mi of gathering lines estimated to result from this proposed sale. In the case of platforms, bottom disturbance would occur only in the immediate vicinity of the structure (2–5 acres). For pipelines, bottom disturbances would result from trenching activities utilized in burial of the gathering lines in a zone approximately 9 meters wide. Assuming all of the pipelines are buried, which is unlikely, for the "worst case" resulting from the installation of 200 mi of pipeline, and 25 platforms a maximum of 840 acres of seafloor would be effected as a result of this proposed sale. However, should a new transmission line to South Texas be required, a pipeline from 50 to 100 miles could be required. Assuming a maximum zone of disturbance from trenching of 15 meters, up to another 600 acres could be disturbed.

B. TIDAL INLETS, BAYS, SOUNDS, RIVERS AND LAKES

As no pipelines are projected to be brought ashore as a result of this sale, the only impact to the seafloor of tidal inlets, bays, sounds, rivers and lakes would occur in those bodies of water which are navigable and would result from erosion caused by wakes of the additional supply and support vessel traffic resulting from this sale. These impacts would be minimal.

C. BEACHES AND SHORELINES

Beaches and shoreline areas could receive impacts from pipeline construction onshore, from oil spills, and from placement of onshore facilities (such as production terminals or transfer facilities). Additionally, minor impacts from debris wash up can result from OCS construction efforts, well support activities, and from recreational fishermen who will be attracted to the additional platforms that may be added to the OCS as a result of this proposed sale.

No new pipelines are projected to be brought ashore as a result of this proposed sale unless production occurs in an area remote from existing pipelines. This condition is uncertain. If a pipeline crosses a beach area, there will be a temporary impact. The area of shoreline disturbed by construction would be 10-15 mi wide and high tides following burial of the pipeline would soon serve to restore the beach terrain. Complete restoration of the beach would take longer, most likely requiring a storm tide or high winds to obliterate the effects of excavation. Should a pipeline enter a marsh shore there would be little beach activity affected; however, there could be long lasting visual impacts due to vegetative and drainage disturbance in the laying process. Likewise, a pipeline crossing a shore backed by forest vegetation will produce an obvious corridor which may be noticeable for many years.

If production terminal facilities are located in or near a beach or any other shoreline area there will be an adverse impact from disruption during the construction phase and elimination of about 16 hectares per terminal plant. This latter impact would be long-term and restoration of the area, if attempted at all, would have to await the depletion of the offshore production which the plant would be designed to serve. These impacts may tend to diminish quality of the area for recreational enjoyment.

In the event of an oil spill resulting from this proposed sale, removal of oil from beaches in the area under consideration would probably involve removal of the contaminated sand and possible replacement of the sand, if needed.

In summary, impacts to the beaches and shorelines resulting from this proposed sale are expected to be minimal in Texas and Louisiana where existing pipelines will likely suffice. In Mississippi and Alabama, a somewhat greater effect could occur if new pipelines should be required.

2. Air Quality

The air quality of the coastal counties on the northern Gulf of Mexico varies widely by area and season. The relatively large amounts of precipitation periodically cleanse the air of contaminants and the prevailing southerly winds aid in dispersing many of the high air pollution concentrations.

Degradation of offshore air quality will occur in cases of oil spills, oil and gas blowouts, pipeline breaks, and the normal exhaust of platform generators and service vessels. Emissions which may be associated with the proposed development of Sale 58A tracts are hydrocarbons (THC), nitrogen oxides (NO_2), carbon monoxide (CO), sulphur dioxide (SO_2), and total suspended particulates (TSP).

THC includes all hydrocarbons except methane, which is excluded because it does not participate significantly in photochemical reactions. Although THC emissions are not a health hazard *per se*, they react with NO_2 and sunlight to form photochemical oxidents or "smog." Health effects include irritation of the eye, nose, and throat. Extended periods of high levels of oxidants produce headaches and cause difficulty in breathing in patients suffering from emphysema. THC emissions occur primarily during loading and balasting of tankers. Onshore THC emissions are associated with gas processing.

CO is a colorless and odorless gas and, when inhaled in large quantities, can cause headaches, dizziness, nausea, vomiting, difficulty in breathing, and death. TSP or inert particle emissions cause irritation to the respiratory tract. Absorption of gases on small particles increases the effect, particularly if the particles penetrate to deeper portions of the lungs.

SO_2 is a colorless and pungent gas which causes irritation to the respiratory tract and eyes. At high concentrations, sulphur dioxide is known to produce broncho-constriction.

NO_2 is a pungent gas which is a contributor to the haze over cities. Nose and eye irritation and pulmonary discomfort are associated with very high NO_2 levels. Another oxide of nitrogen, nitric oxide (NO) is easily converted by a chemical reaction to NO_2 in the atmosphere, and the term oxides of nitrogen (NO_x) is often used to describe the sum of NO and NO_2. Both NO and NO_2 participate in photochemical reactions leading to smog.

CO, TSP, SO_2 and NO_2 emissions may occur as a result of offshore drilling and oil processing where power for these activities is supplied by internal combustion engines (diesel or gas). CO and TSP emissions from these sources are very small, and do not create a major problem. NO_2 emissions are more substantial, however, and SO_2 emissions in very limited instances (as in the case of an offshore storage and treatment facility) can be substantial also.

A. Offshore Sources

An average composition (Levorsen, 1967) of natural gas from an onshore field (an offshore field would be similar) in Texas is as follows: methane 92.5 percent, ethane 4.7 percent, propane 1.3 percent, butane 0.8 percent, and pentane and heavier gases, 0.6 percent (small amounts of sulfur are usually present).

If a blowout should occur at a gas well and did not burn, the above gases in a comparable ratio would be released into the air. A typical Texas offshore well produces approximately one million cubic feet of gas per day, so a blowout could reasonably be expected to release at least this much gas into the atmosphere. However, if the gas well were burning, combustion would be essentially complete and the emissions would consist almost entirely of carbon dioxide (CO_2), water, and any sulfurous gases would be oxidized to SO_2. It is impossible to predict the probability of this occurrence.

If a blowout at an oil well occurred and released crude oil into the water, the resulting impact would be substantially greater. If the oil does not burn, some of it would evaporate. During the Chevron 1970 spill, it was estimated that approximately 15 percent of the 30,000 barrels (bbls.) spilled evaporated. At an average density of 310 lb/bbl, this incident would have introduced approximately 1.4 million lbs of hydrocarbons into the air. Some oil spills in the past have resulted in fires, however, the chance of this occurring is minimal. In fact, if this were to occur, emissions from the crude oil would be relatively low in reactive compounds.

A reasonable estimate of the ranges of emission, assuming complete combustion, that an oil well fire could produce per 1,000 bbls burned, might be as follows (Levorsen, 1958): CO_2; 340,000-47,000 lbs., SO_2; 620-4,000 lbs. (SO_2 emission would be less for Gulf of Mexico crude oil, which range from 0.1 to 0.5 percent sulfur), and NO; 660-10,000. However, combustion of oil would be incomplete, therefore, the emissions would contain a smaller amount of the above compounds, and would include such materials as volatilized petroleum, particulate carbon, carbon monoxide, nitrous oxide, sulfur monoxide, along with other altered or partially oxidized matter. There is no reliable way to predict in advance the relative volumes of each of these possible emissions because it would depend among other things, upon moisture content of the air, wind speed, pattern of oil spray from wild wells, number of wells involved, chemical content and physical character of the oil itself, and types of equipment and materials other than oil that might also burn. Many areas along the coast have a substantial photochemical oxidant problem. A large oil spill combined with a prevailing onshore wind would cause severe problems if this type of accident occurred from tracts 13, 14, 15, 18 (Galveston-Houston) and tract 24 (Port Arthur).

Massive spills from wild wells are not the only source of spilled oil. A number of minor spills during the first nine months of 1972 released over 800 barrels of oil. The net result is that a small amount of spilled oil is floating somewhere on the waters of the Gulf of Mexico almost continually. The evaporation of this oil may cause elevated levels of hydrocarbons in the sea breeze coming off the Gulf. At the present time there is no evidence as to the source of these materials.

Aside from blowouts, air emission sources from OCS activities as a result of this lease sale may include power generation and waste gas disposal.

The major single source is power generation which is required for drilling, gas compression, water disposal, and electricity. This power is generated via gas or liquid-fueled turbines or reciprocating engines which emit nitrogen oxides, sulfur oxides, hydrocarbons, carbon monoxide and particulates.

Waste gas disposal is required during drilling as a result of drilling fluid degassing. During production, major waste gas sources include pressure-relief valves, compression by-pass loops and oil storage tanks. This waste gas is approximatley 90 percent methane with trace amounts of other hydrocarbons and carbon monoxide.

The total uncontrolled emissions from offshore facilities in the Gulf of Mexico (state and federal waters) have been estimated as follows in Mg/yr.

NO_x	SO_2	HC	CO	Particulates
43,083	2,101	237,893	11,643	1,439

Since leasing activity in the Gulf of Mexico is generally declining, activities resulting from this proposed sale will tend to replace existing activities; therefore, no substantial additions to these total figures are expected. However, certain nearshore tracts (13, 14, 15, 18, and 24) are located near onshore areas with current air pollution problems—Galveston-Houston and Port Arthur areas. If we assume that each of these tracts will receive four exploratory wells and one platform with six development wells each, drilled to a depth of 10,000 feet, and with peak production of 14 MMCFD, then the following emissions would result from each tract:

Peak production Mg/yr.)

NO_x	SO_2	HC	CO	Particulates
41.4	2.0	1,200	11.24	1.54

These could be considered inconsequential since the coastal counties of concern receive emissions of these pollutants at levels measured in tons/year (see Tables 17 through 20). Furthermore, the variable coastal winds and large amounts of temporally distributed precipitation described in Section II.A.2 would serve to ameliorate these potential effects on onshore air quality.

The Department of the Interior is currently developing regulations which address the problem of potential onshore air quality degradation as a result of OCS activities. Also, studies are being funded to prepare emissions source identification and inventory for representative OCS operations, to determine the current onshore air quality through compilation of existing data, and to evaluate pertinent meteorological conditions for transport of emissions.

While the extent of regulation for onshore operations is well-defined, there is some uncertainty surrounding the regulation of offshore air emissions from OCS operations. The OCS Lands Act Amendments explicitly direct the Secretary of the Interior to control air pollution from OSC activities which may significantly affect the air quality of states. Regulations implementing this provision are being drafted and, barring unforeseen delays, should be promulgated prior to the proposed date for Sale No. 58A.

B. Onshore Sources

All onshore operations which will result from proposed Sale No. 58A will be required to meet all Federal, State and local air quality standards. The onshore activities will be subject to all permit requirements and will be required to comply in full with all onshore operating conditions, including, where necessary, offsets. The major factors that could result in onshore air quality degradation are transportation (usually freight) increases, population increases, and construction of roads, gas processing plants, and refineries. However, no increases of this nature are expected as a result of this proposed sale.

Oil produced as a result of this proposed sale is not expected to create the need for increased refinery capacity and other petrochemical industries. Instead, it may take the place of imported oil or oil that will not be furnished from domestic sources due to declining production or other factors.

Estimates of additional air quality degradation due to this proposed sale are difficult to make, but since activities resulting from this proposed sale are expected to largely replace existing activities, no increase in pollution is expected. In addition, a study conducted on the potential impact of proposed Sale No. 51 on air quality in the same general area as this proposed sale concluded that the "projected impact of air pollution from the economies resulting from oil and gas development from OCS Sale No. 51 would not create any problems in the counties and scenarios analyzed." (Watson and O'Farrell, 1978).

In summary air quality will not be severely degraded as a result of this proposed sale. The largest amount of emission offshore would result from oil and gas well blowouts. In the short term, if this type of accident occurred from tracts 13, 14, 15, 18 (Galveston-Houston) and tract 24 (Port Arthur), it may aggrevate pollution problems in these areas. Since there will not be any increased refinery development, there would not be any long term increase in onshore air quality degradation as a result of this proposed sale. For the same reasons, this proposed sale is not expected to have any cumulative effect on air quality due to any future sales that may take place since any such future sales will probably continue the pattern of Gulf of Mexico oil and gas operations of replacing existing production rather than adding to it.

3. Water Quality

During drilling and oil production the water quality of the Gulf may be altered and degraded in several ways. Many of the chemical and physical factors which will be transferred to the Gulf during various phases of oil production will represent potential hazards of degraded water quality may be found to be insignificant or significantly adverse. The magnitude of these potential hazards should be answered by future research.

On September 15, 1975, the EPA published in the Federal Register (40 CFR 435) a notice of interim effluent limitations guidelines and new performance standards for the offshore segment of oil and gas extraction point source category. The effluent limitation guidelines are concentration based as opposed to a mass per unit production base.

It is indicated that the major source of waste water generated by offshore facilities are produced waters. The major constituents in waste waters resulting from the oil and gas extraction industry are oil and grease, residual chlorine, and floating solids (Section III.A.1.). By 1983, industry must have the best available technology economically feasible. For water quality standards, the Act's objective has been interpreted to mean the restoration and maintenance of the chemical, physical, and biological integrity of the nation's water.

Several methods of treatment technology for waste water from produced waters may be employed to achieve final limitations. It is also noted that drilling muds and drill cuttings may be discharged if they are water based and their discharge does not result in free oil on the surface waters. Muds and cuttings that are oil based may not be discharged. Presently a drilling mud report is required when submitting for a Plan and Development Permit from USGS, this covers both water based and oil based muds. The requirement for this can be found in OCS Order No. 7. The Environmental Protection Agency has proposed effluent limitations which would apply to the discharge of formation waters and are broken down into 3 basic categories: the best practicable control technology current available (BPCTCA), the best available technology economically achievable (BATEA), and new source performance standards (NSPA). The BPCTCA and BATEA regulations apply to existing sources and take effect in July 1977 and 1983 respectively. The proposed NSPS are identical to the BATEA regulations and are applicable to new sources, the construction of which is commenced after the promulgation of the regulations. These have been developed for two subcategories of installations: the "near offshore" which is within 3 miles of the coastal basin and the "far offshore" which is beyond 3 miles of the coastal baseline. For the near offshore category BPCTCA is an average of 48 mg/1 for oil and grease in produced water and BATEA calls for no discharge to surface waters. For the far offshore category, BPCTCA is also 48 mg/1 but BATEA is 30 mg/1 average discharge of oil and grease in produced water.

Bottom sediments would be put in suspension during exploration and development by emplacement of blowout preventors, drilling platforms, sea-bottom equipment, pipeline burial, and disposal of drilling fluids and cuttings. Pollutants that are entrapped in the bottom sediments would be dispersed into the water column. A turbidity plume may be created. The life and size of this plume depend upon the size, shape, and density of the suspended material, and the turbulence of the water.

The disposal of drilling fluids and cuttings also results in a turbidity plume. It is estimated that in drilling to 10,000 feet approximately 995 tons of drilling muds and 511 yds^3 of cuttings are disposed overboard during 20 days of drilling. The largest turbidity plume observed in the Gulf of Mexico that has resulted from drilling operations was 20 m wide and in excess of 2,000 m long.

While no definite conclusions have been drawn on the manner in which drilling mud chemicals and drill cuttings may contribute to pollution in the marine environment research in this area is currently in progress. Possible pollutant characteristics include: acute toxicity to fish; high immediate dissolved oxygen demand; and high concentrations of organic carbon, total nitrogen, phosphorous solids, chemical oxygen demand and chromium.

The production and discharge of formation waters (oil field brines) has been discussed earlier. Three components or properties of formation waters contribute to water quality degradation when released into the Gulf. These include: entrained liquid hydrocarbons, dissolved mineral salts, and absence of dissolved oxygen.

Within the proposed lease area, the maximum oil production is estimated to be 21.6-59.8 million barrels of oil. This would be extracted over a twenty year period. At peak production, the expected daily production of oil would range from 8,500-23,000 BPD. Considering the maximum amount of formation water production (0.6 barrels of formation water per barrel of oil produced), approximately 5,100-13,800 BPD of formation water would be produced.

In the Gulf of Mexico many platforms are disposing of treated formation waters where the treatment equipment puts out an effluent less than 25 ppm oil content. For various reasons, the oil content from others may be higher; however, in accordance with the previously mentioned BPCTCA regulations promulgated by EPA, all produced water discharges in OSC operations are limited to an average of 48 mg/l oil and grease.

Due to the many factors which contribute, to the physical and chemical characteristics of formation waters, discussed in Section III.A.1.b. no reliable estimate can be made to the extent of the impact from these waters. The characteristics of formation water can change during the oil production period as more reservoirs are tapped or if accidental leakage occurs between reservoirs. However, based on acute toxicity, formation water in general has been shown to be relatively innocuous. Based on research results available to date, the disposal of treated formation water would not be expected to cause significant water quality degradation on the Outer Continental Shelf.

Water quality could be further degraded as the result of accidental oil spills. Part of this spilled oil would probably be dispersed into the waters of the Gulf where it will be reduced further by microbial degradation and weathering.

It is estimated that from zero to two terminal storage facilities may be constructed onshore as a result of this proposed sale. These facilities could have a slight impact on the water quality in the vicinity. The amount of effluent discharged and the area in which the facility is constructed is a major factor in determining the extent of the impact. These facilities would come under State jurisdiction in regards to effluent discharge. The Water Quality Management Plans (P.L. 92-500) for each respective state (Texas and Louisiana) provide a baseline for the present water quality for each basin. Depending on the location of the terminal facilities mathematical models would be calculated for the particular basin and the water quality of the area can be determined. Since these facilities are located on shore the regulatory power to provide sufficient waste water discharge is regulated by State Water Quality Boards under EPA guidelines.

In summary, offshore water quality is most likely to be affected by drilling fluids and cuttings, accidental oil spills, and resuspension of bottom sediments.

As previously discussed, the turbidity that results from the discharge of drilling fluids and cuttings is localized and its persistency is short. Thus there would be no severe water quality degradation problems resulting from turbidity.

Oil spills present a more serious problem. Yet even in the case of spills the diluting effect of the large volumes of Gulf waters and the microbial degradation of the hydrocarbons will act to reduce the deleterious effects over time. The seriousness of the effects on water quality will depend on the amount of oil spilled and the depth of the water; in shallow waters the oil may become entrapped in the sediments to be released later when the sediments are resuspended during storms. Unfortunately, none of these effects can be quantified, partly due to our lack of precise knowledge of the fates and effects of oil on the environment, and partly because so much depends on the particular circumstances of a spill.

Significant water quality degradation in the Gulf of Mexico as a result of OCS oil and gas operations has not been observed; however, short term effects in the immediate vicinity of operations have been observed in a few cases. BLM is currently funding research in an intensively developed area of the Gulf which should highlight any apparent cause and effect relationships.

D. The Socioeconomic Environment

1. Resource Utilization

a. Military Uses

The Gulf of Mexico is used rather extensively by the Navy and Air Force for conducting military training and research operations. These current activities consist of missile testing, ordnance testing, drone recovery operations, electronic counter measure activities by the Air Force and training of military personnel. Pilot training including air-to-air gunnery, carrier operations and mine research activities are conducted by the Department of the Navy. Most of this activity takes place in areas designated for these purposes. Nine tracts offered for this proposed sale are within the Navy's Corpus Christi Operating Area (w-228). Depending on the density of permanent drilling structures within the operating area, there may be use conflicts with the Navy's offshore air-to-air gunnery ranges and carrier operating areas.

Live ordnance testing by the Air Force occasionally involves emergency release of ordnance outside designated bombing areas; however, these are limited to practice bombs containing a 10-pound explosive. Because Air Force procedures provide for dropping ordnances over water in the event of an emergency, which precludes the use of a designated salvo area, a potential hazard exists. Such emergencies have occurred in the past, and ordnances have been jettisoned as far shoreward as Choctawhatchee Bay. No quantification as to the amount of ordnance located in and outside the salvo area was available. The possibility of occurrence of unexploded munitions on the ocean floor in the proposed lease sale area is extremely remote.

Oil and gas operations in an ordnance disposal area are potentially hazardous. The accidental detonation of munitions during the course of oil and gas drilling or other activities, should it occur, could result in loss of life, destruction of property or creation of a potential for fire and polluting events and death or injury by concussion to marine life. At this time, we consider the probability of occurrence low because unexploded ordnances and sunken WWII vessels are detectable through magnetometer surveys and sophisticated magnetic detection devices used as part of geophysical survey activities. Also, in many cases, divers can be used as part of geophysical survey activities. Also, in many cases, divers can be used to aid in locating and plotting munitions and sunken vessels on the ocean floor.

The possible use of shallow, nearshore portions of the continental shelf for ordnance disposal would prohibit full exercise of the multiple use concept common to natural resource management programs. However, it is not Department of Defense (DOD) policy to dispose of ordnance in shallow waters. Such disposal is only carried out in an extreme emergency and only when necessary for the preservation of life or saving of an aircraft and never as a routine disposal procedure. Therefore, this conflict is not anticipated should this proposed sale be held.

b. Recreation

(1) Beaches and shoreline recreational resources

Recreational activity on beaches and in shoreline areas could receive impacts from pipeline construction onshore, from oil spills, and from the placement of onshore facilities (such as production terminals or transfer facilities) should they be located in or near a recreational area. Additionally, minor impacts from debris washing up can result from OCS construction efforts, well support activities, and from recreational fishermen who will be attracted to the additional platforms that may be added to the OCS as a result of this proposed sale.

No new pipelines are projected to be brought ashore as a result of this proposed sale unless production occurs in an area remote from existing pipelines. Tracts 1-4 in the South Texas OCS, for example, are isolated from currently producing hydrocarbon zones. Should these gas prone tracts be leased and commercial discoveries result, it is probable a new transmission pipeline will be required for the gas to reach onshore processing facilities. The closest existing onshore gas processing plants in South Texas are in the Brownsville and Corpus Christi areas; therefore, it is logical to assume a transmission line constructed for gas production in the vicinity of tracts 14 would come ashore either to the north or south of Padre Island National Seashore. Any pipeline landfall in South Texas is likely to cross and impact a public beach, wetlands and upland areas. If a pipeline crosses a beach area used for recreation, there will be a temporary impact. The area of beach disturbed by construction would be from 10–15 meters along the linear path of the pipeline. High tides following burial of the pipeline would soon serve to restore the shoreline beach terrain shortly after construction. Restoration of the beach would take longer, most likely requiring a storm tide or high winds to obliterate the visible effects of excavation. Should a pipeline enter a marsh shore there would be little beach activity affected; however, there could be long lasting visual impacts due to vegetative and drainage disturbance in the laying process. In contrast to the negative effect of canals created by some types of pipeline construction, there is also a positive spin off to recreationists who fish in pipeline canals or use them for access in pursuing other recreational activities, mostly fishing and hunting. A pipeline crossing a shore backed by forest vegetation will produce an obvious corridor which may be noticeable for many years. These same corridors are favored locations for hunting and for off road vehicle use. Physical interference with recreational activities, should a pipeline be needed, will be minimal and short-lived.

If production terminal facilities are located in or near a beach or any other area used for recreation, there will be an adverse impact from disruption during the construction phase and elimination of about 16 hectares per terminal plant for recreational uses. This latter impact would be long-term and restoration of the area, if attempted at all, would have to await the depletion of the offshore production which the plant would be designed to serve. These impacts may tend to diminish quality of the area for recreational enjoyment. It is anticipated this proposed sale would generate zero to two onshore terminal and storage facilities to accommodate oil and gas production from this sale. However, unless discoveries occur remote from existing facilities and pipeline networks, it is not expected that construction will occur on new sites. It is probable that any expansion needed will take place on existing terminal sites. It is not expected that any new gas processing facilities or refineries will be needed as a result of this proposal.

Water sports such as swimming, diving, spearfishing, fishing for finfish and shellfish and boating could also be directly affected by an oil spill. These activities would also be affected where chronic low-level discharges have caused a degradation of the environment. Water enhanced recreation activities such as beachcombing, painting, nature study, camping or sunbathing on a beach or marine associated shoreline would be made much less attractive for an indeterminate period if a major oil spill were to come ashore.

Removal of oil from beaches used for recreation in the area under consideration would probably involve removal of the contaminated sand and possible replacement of the sand, if extensive areas are affected by heavy crude. The time period of clean-up in this case would depend on the extent and degree of beach area affected. Recreational use of the area would be precluded during the time that oil covered the beach and during the clean-up process.

The impacts of an oil spill discussed above would be more keenly felt if the recreational area involved is intensively used or considered to have unique or outstanding recreational values, such as Grand Isle State Park, Galveston Island and Padre Island or Gulf Island National Seashores. Not only would the impact be felt by the recreational users of the area, but, consequently, the community of businesses whose economic well-being depends on use of recreational resources by tourists. If an oil spill were to cover outstanding recreational beaches during the height of the recreational season, residents and tourists would not be attracted to a beach area contaminated by oil or undergoing a clean-up process, and there would be a resultant economic loss. Only 50 of the proposed 122 lease tracts are considered oil prone and none of these tracts are off the Texas or Alabama coasts, therefore the risk of oil spills from offered lease tracts impacting shoreline locations in Texas and Alabama is diminished accordingly.

As a result of this proposed sale, up to 200 mi of new offshore pipeline may be needed and possibly two new onshore storage terminals. Location of facilities would, of course, depend upon which tracts are leased and where new production actually occurs. It is unlikely that any new pipeline land-falls or shore facilities would be needed in the central Gulf area.

Of the 122 tracts considered for lease, most lie off the Louisiana coast within close proximity to developed or formerly leased areas (visual 1).

Twenty-three of the offered lease tracts are scattered on the OCS off Texas. The closest tract to land is within 3 miles of a Louisiana beach and the fartherest proposed lease offering extends 126 miles from the coastline.

In relation to some of the primary coastal recreation shoreline areas off Texas, two tracts lie 12-15 miles seaward of the southwestern end of Padre Island National Seashore; one tract lies approximately 15 miles seaward of the western end of Matagorda Island and another about 12 miles off the eastern end; three tracts under consideration for lease lie 15-20 miles south of Galveston Island and Galveston State Park. Lease site operations on any of these tracts, should they be acquired, would barely be visible from the nearest shorelines under ideal visibility. Consequently, normal lease site activities could only cause minor distraction, if any, to shoreline users of Texas' coastal beaches. Oil and gas exploration and development are occurring in state waters between shoreline recreational resources and the closest tract offerings for this proposal.

Eight study tracts off the coast of Louisiana are within 3-10 miles of major coastal recreation features. Normal operational activities on these tracts such as drilling and platform development would be readily visible from the nearshore recreational features and thereby be a source of potential distraction to some shoreline recreators. As noted on Visual 4, the resource areas most closely associated with the nearshore tracts (Rutherford Beach, Cheniere-Au-Tigre, Isles Dernieres State Preservation Area, Rockefeller Wildlife Refuge and Pass-A-Loutre) are either undeveloped or proposed units of the state parks system or wildlife areas. It is believed that none of these units would accommodate intensive recreation use in the near future, if ever.

Should any of the proposed lease tracts to the east of the Mississippi River be acquired, normal operational activities would not be detectable by users of the Chandeleur Islands (Detta-Breton National Wildlife Refuge and Wilderness Area) or the Mississippi units of the Gulf Islands National Seashore, including the Horn and Petit Bois wilderness unit.

Barrier islands along the coasts offer considerable protection to bays and estuaries against encroachment of offshore oil spills. These barrier islands and their gulfside beaches are a major recreational resource in their own right and oil spill damage could be significant. However, where wave action is strong the effects of an oil spill should be shorter lived on the outer beaches than in the bays and estuaries.

In summer accidental oil spills of considerable volume resulting from exploration and development of offered tracts or transportation of oil produced pose the greatest risk of affecting shoreline recreation areas. Historically petroleum development in the Gulf of Mexico over the past 30 years has caused very little disruption of shoreline recreation. Besides oil spills, debris improperly discarded offshore by oil field workers and commercial and recreational fishermen (some of which are attracted to offshore platforms), causes minor impacts on recreational beaches when washing ashore.

Because of the extensive offshore petroleum activity already in the Gulf of Mexico (Visual 1) the additional offering of 122 tracts should add very little to the cumulative effect on shoreline recreation areas. Maintaining the current level of production offshore will result in some oil spills and pollution instances which can and have caused hydrocarbon residues that often come ashore. These residues form globs referred to as tar balls. When bathers or beach users encounter tar balls it significantly detracts from enjoyment of their recreational experience.

(2) Sport fishing and recreational boating

A major oil spill would adversely affect sport fishing and recreational boating. Boaters and fishermen would not want to soil their boats by entering a contaminated area for the duration of the spill incident. In addition, fish landed could be tainted by spilled oil.

Aside from damage caused by oil spills, there is considerable evidence that oil and gas operations have a favorable impact on sport fishing activities. One favorable impact is the result of sports fish concentration due to the artificial reef effect of offshore platforms. In the open sea, offshore platforms provide habitat for organisms which provide fish food and also cover in areas that are largely devoid of those essentials. Myriad forms of microorganisms in the water drift by these structures and attach themselves, soon encrusting all exposed surfaces on the platform. Hard substrate is necessary for encrusting organisms: barnacles, hydroids, corals, mussels and other invertebrate organisms which serve as links in the food chain. Randall (1968) has stated that artificial reefs provide protection, food sources, spawning sites and spatial orientation markers for fishes. The same author found that artificial reefs attract available fish from surrounding waters, and increase the size of some populations by providing additional protected areas and food for both the young and adults. The typical platform located in 30 m of water will have a surface area of about 0.8 hectares (over 8,082 square meters) (Shinn, 1974). Other advantages of these structures are the free movement of water through and around them and their high profile. The high profile provides habitat for a wide variety of fish ranging from the turbid dark bottom zone to the lighter and clearer surface waters. Platforms are easily located by boaters and fishermen and the platforms and their personnel are a source of emergency assistance for all offshore sportsmen.

A recent research project at Texas A&M attempted to determine fishermen use of artificial reefs in the offshore marine area off Galveston and Freeport. Included in the study area were several artificial reef developments along with oil and gas platforms. The final report (Ditton and Graefe, 1978) indicates functional oil and gas "rigs" are more popular with offshore recreators than any other artificial structure in the study area. Furthermore, they determined that 87 percent of the recreational boats that fished offshore used oil and gas platforms.

Offshore platforms are the major focus of sports divers from coastal Louisiana and may be expected to contribute significantly to the sport as their number increases in other areas of the Gulf. Divers are drawn to these structures for spear fishing, photography and general pleasure diving. The submerged portion of structures contribute to safety by assuring the divers' orientation to depth and distance (Estopinal, 1975).

Although the primary impact on which this section focuses involve the effects derived from OCS related inducements such as creation of platforms and structures, eventual removal of platforms and structures could have a significant impact on fishing and related economics as well. The expected life of a production platform ranges from 10 to 30 years. The bulk of major drilling activity normally occurs during the first few years of a platform's existence and it's during this time that the potential for environmental stress is greatest. During the remaining life of an offshore platform a marine community and permanent and transient fish populations normally become associated with the structure. Depending on accessability, water depth, and other factors the platform can become a very popular fishing location. The abrupt removal of such a platform as required by Federal regulations can cause disruption of an established marine community as would the removal of a thriving designated artificial fishing reef.

Fishermen who have become accustomed to a particular platform as a favored fishing location may be ultimately affected by platform removal.

Currently the situation in the Central Gulf of Mexico is one of displacement. Whereas some platforms are being removed others are being constructed. Eventually continued extraction of finite mineral resources is bound to cause a decline in the number of offshore structures contributing to productive offshore fishing.

There are now over 2,000 structures in the Gulf of Mexico most of which are located south of Louisiana. From May 1977 to May 1978, 24 production platforms have been removed from the central and western Gulf of Mexico. It is estimated up to 25 platforms will be installed on the OCS as a result of this proposal. Development in lease tracts offered closet to shore would most likely attract recreational fishermen. Efforts such as the Liberty Ship artificial reef programs of Texas, Alabama and Mississippi can provide some alternative to platforms as designated offshore fishing locations.

In summary this proposed sale is likely to increase fishing opportunities in the OCS as a incidental result of offshore platform construction. The boating industry and marine supply enterprises should be mildly stimulated as specialized equipment is required by anglers venturing several miles into the Gulf of Mexico. Pollution instances resulting during the exploration, development, production, and transportation phases on leases sold may temporarily discourage sport fishing and recreational boating in some areas.

This proposed sale in conjunction with former sales and anticipated future sales will further increase the sport fishing attraction of the general OCS area and add to the potential pollution causing sources which can discourage sport fishing and boating both offshore and nearshore.

(3) Aesthetic and scenic values

If visibility is not hindered by air quality, some portion of a 30 m (100 feet) high offshore structure could be seen from the beach if it were located 27 km (17 miles) or less from shore.

Thirty-six of the tracts under study are close enough to shore to permit observation of some lease site operations during favorable conditions by someone on the Gulf shoreline peering seaward. Exploration and development activities in these tracts may be visible from the nearby Texas coastlines and could be perceived as a subtle intrusion to an unobstructed view of the Gulf of Mexico horizon. Existing oil and gas development in State waters and adjoining Federal leases have already had minor effects on many vistas.

Any floating material such as debris or oil that is cast upon the beach or washed into a bay would constitute an impact upon the aesthetic values for users or owners of the area.

Even after burial of a pipeline, the remaining scars will cause an impact on the aesthetic values of the beach and associated shoreline for some period of time. The impact will endure until sand has been redistributed by wind, tides, and rain and another growing season brings about revegetation.

Canals and ditches constructed in marsh areas which are not backfilled will have an adverse impact on aesthetic values. The laying of a pipeline in such an area would result in an open canal or ditch through the marsh. This would cause an add-on effect in much of the central Gulf region since there are at present numerous waterways of this type.

There would be an adverse impact on aesthetic and scenic values resulting from construction of onshore terminals, storage facilities and pumping stations if these facilities are located in areas which are valued for their natural or scenic qualities. Some people will find the visual impact of these facilities aesthetically displeasing. There may also be noise pollution associated with vehicular traffic to and from these facilities and noise pollution resulting from pumping stations that would reduce the serene and natural qualities of an otherwise aesthetically enjoyable area.

The probability for the aforementioned impacts to occur is considered low since few onshore facilities and no pipeline landfalls are expected to result from this proposal. However, if any should occur, the duration would depend on numerous variables such as the productive life of the tracts proposed, and the extent would be partly reflected in an individuals' own values.

In summary the most lasting impact on aesthetic and scenic values would result should the 36 tracts closest to shore be leased. Impact along the Texas Coast where beachfront recreation resources and use are extensive is considered minimal as tracts offered for lease are at least 10 miles (16 km) from the shoreline. Even though a rig operation should be perceptible at such a distance it would be difficult to distinguish from a seagoing vessel. Such a contrast on the far distant horizon will have a minor impact on aesthetic sensitivities.

Along the Louisiana coast where several tracts fall within 3 to 10 miles from the shoreline, exploration and development activities will cause a recognizable contrast to the natural offshore horizon. Two factors tend to lessen this impact: (1) Most of Louisiana's shoreline has no public access; therefore, few people go to the shoreline to enjoy an uninterrupted ocean view, (2) where access is provided, Holly Beach for example, extensive offshore activity from former state and Federal lease sales has already added significant contrast to ocean views.

Aesthetic values will be severely affected for a short duration should significant quantities of crude oil come ashore in a recreation use area. Additionally the offshore activity stimulated by this proposed sale will add to the floating debris improperly discarded in the Gulf of Mexico, much of which ends up on beachfront areas detracting from aesthetic enjoyment and adding to maintenance problems.

(4) Other impacts on recreation

Revenues derived by the U.S. from offshore mineral development have had a tremendous impact on the annual appropriations into the Land and Water Conservation Fund (L&WCF). The L&WCF is the major federally financed grants program instituted by Congress to assist local political subdivisions in developing and acquiring outdoor recreation lands and facilities and has assisted states in financing comprehensive outdoor recreation planning. Likewise the L&WCF has been instrumental in assisting Federal land managing agencies in purchasing recreation lands and endangered species lands in national parks, national forests, national wildlife refuges, national wild and scenic rivers and national wilderness areas throughout the country. Over $2 billion have been dispersed through the Heritage Conservation and Recreation Service (formerly Bureau of Outdoor Recreation) since the fund's inception in 1965. Approximately 60 percent of these revenues were derived from lease bonuses, royalties, and rentals stemming from exploration and production of oil and natural gas on the federally administered outer continental shelf. An amendment to the L&WCF Act has increased the annual L&WCF authorization ceiling from $300 to $900 million dollars thereby indicating a continued and increasingly important relationship between offshore mineral development and enhancement of America's recreation estate.

(5) *Summary of impact on recreation*

This proposal should lead to: (1) an enhancement of recreational fishing in the Gulf of Mexico within leased tracts which are developed; (2) contribute to financing of outdoor recreation facilities and land acquisitions throughout America; (3) and cause adverse impacts to the aesthetics of some shoreline recreation resources bordering the central and western Gulf of Mexico. When considered in conjunction with past lease sales and probable future sales the effect of these positive and negative impacts can be compounded.

Many years of extensive offshore oil and gas development in the central Gulf of Mexico has contributed to a buildup of coastal development. Support industries directly and indirectly associated with OCS activities are located in the coastal zone and provide employment for many people. These same people require basic services such as schools, housing and recreational facilities. Therefore the cumulative impact of long term OCS oil and gas development as is typical in the central Gulf of Mexico, tends to increase use and stress on existing coastal recreational facilities and resources, as well as creates a demand for additional facilities.

An example of how extensive offshore energy development may indirectly contribute to an adverse effect on shore-based recreational resources has manifested itself this past summer in Grand Isle, Louisiana. Grand Isle State Park, which annually attracts upwards of 500,000 visitors, was forced to close temporarily during its intensive use season for lack of sufficient water to operate its facilities. Grand Isle's onshore oil and gas supply and processing facilities supported by OCS development competes for the limited water supply available to the island. A grant through the Coastal Energy Impact Program (CEIP) has increased the islands water capacity and will assure the park a sufficient water supply during future peak use demands. Additionally, the development of new park and recreation areas in Lousiana's coastal zone have been approved and determined eligibile for funding through these grants.

CULTURAL RESOURCES

(1) *Offshore*

It is estimated that over 1,000 potentially historic shipwrecks have been lost in the central and western Gulf of Mexico. Eighteen shipwrecks with known (unverified) locations fall within 15 Sale 58A tracts (26, 29, 31, 38, 45, 49, 63, 74, 76, 82, 93, and 96-99). Some of these reported shipwrecks have potential historic value, others are contemporary vessels of no historic value; while others have simply been reported as wreck sites with no reference as to ship type or historical period. Should the suspected shipwreck locations be accurate and come into physical contact with oil and gas operations some impact can be expected to potentially valuable historical resources. The existing underwater shipwreck sites on the National Register of Historic Places should be unaffected by this proposal unless a pipeline should be routed across the sites.

No underwater archaeological sites have been identified and verified on the OCS, therefore no known submerged habitation sites will be affected by the proposal.

Additionally, 72 tracts (63 percent) fall within the high probability zone for the occurrence of unknown cultural resources. Visual Nos. 1 and 4 depict the demarcation line which divides the high from the low probability zones. Should any unknown shipwreck or early man living sites be located on the bottom or beneath sediments, they would be susceptible to alteration from drilling activities and platform and pipeline placement offshore. Some moderation of the contextural relationship of an archaeological assemblage, be it historic maritime wreckage or an exposed early man living site, is possible. Damage to actual artifacts is also predictable should they come into contact with a drill bit, the weight of an offshore platform, the snag of an anchor, or the force of an underwater pipeline jet sled. Conversely, lost cultural resources exposed to the ravages of the sea are subject to demise from chemical and biological agents and are susceptible to damage from other man induced activities disturbing the floor of the Gulf of Mexico. Marine mining activities could lead to a discovery, potentially expanding our knowledge of the past which may be foregone without probing the seafloor for oil and gas. With an estimated maximum of 310 wells and 25 platforms resulting from this proposed sale, a very small portion of 1 percent may be directly affected within leased tracts. The burying of 100-200 miles of connecting pipelines within and between lease tracts could also interact with and affect an unknown cultural resource and expands the potential area of impact to cultural resources resulting from the proposal.

Leasing oil and gas rights in the central and western Gulf will ultimately lead to the transport of millions of tons of metal and steel offshore. Much of this magnetically sensitive material will remain on the seafloor or imbedded in the sediment of the seafloor. Should some of the proposed sale tracts be leased, explored, and developed, most of these metallics introduced into the Gulf will be in the immediate vicinity of the leased blocks and chosen transportation corridors. These metallics will mask future efforts to locate cultural resources. The primary tool for finding lost maritime wreckage or historic resources such as shipwrecks and airplanes is the magnetometer which can remotely sense magnetic objects on or under the seafloor. Introducing metallics prior to a magnetometer survey will therefore impact subsequent efforts to locate cultural resources in certain areas of the Gulf of Mexico.

Based on CEI's study and comments made through the Texas State Historic Preservation Office lost shipwrecks are most likely to be close to shore and near historic ports or inland passageways. Accordingly the 13 tracts near the vicinity of the Federal/State decree line and within 10-20 miles of the mouths of the Colorado, Sabine, Mermentau and Mississippi Rivers (tracts 7, 24, 25, 26, 91-94, 96-99, and 102) and the 4 tracts within 15 miles of Galveston Island (13-15 and 18) as well as the tracts already noted with reported shipwrecks may be considered the most sensitive within the high probability area (Visual 1).

(2) *Onshore*

It has been estimated that under conditions of ideal visibility some portion of a 30 m (approximately 100 feet) high offshore structure can be perceived (not necessarily recognized) up to a distance of 27 km (approximately 16 miles). None of the tracts being considered for lease in proposed sale are within obvious visibility of sites on the National Register of Historic Places onshore. Therefore, development on any study tracts would not cause a blatant visual intrusion to any visitor seeking historic appreciation anywhere within the coastal zone.

There is, however, a small chance that an oil spill from an offshore lease site or transportation facility could affect onshore historic resources. Most shoreline cultural resources on the National Register of Historic Places (forts, lighthouses, etc.) are protected from tidal action by natural or artificial buffers such as beachfronts and bulkheads. Even if an oil spill reached shore in the vicinity of an onshore historic resource and the primary historic features were unaffected, the overall historic site or the aesthetics of the area could be negatively impacted. Such an impact would be a nuisance and a detriment to visitors seeking historic appreciation but should not affect the quality of the primary historic resource. Additionally the effect should only be temporary until containment and cleanup operations are complete. Furthermore, should unprotected prehistoric sites along shorelines be coated with petroleum hydrocarbons any organics associated with such a site may be contaminated. Such contamination would be a significant detriment to future archaeological investigations such as radiocarbon dating. Significantly, none of the tracts under study for this proposal off the Texas coast are considered oil prone. This greatly reduces the already slim potential for cultural resources along the Texas shoreline to be affected by an oil spill as a result of this proposal.

The U.S. Geological Survey has indicated up to two storage or terminal locations onshore may be required as support facilities in the event of oil and gas production from this proposed sale. Support facilities already in existence would most likely be utilized. Consequently, there is some potential for adverse effects upon cultural resources stemming from onshore facilities directly associated with this proposal.

To summarize, it is possible that some unknown cultural resources, most likely shipwrecks, may be disturbed should leasing and development ensue from this proposal. Should this occur, it is most likely to result from pipeline construction.

In trying to put this impact assessment into perspective, one should consider effects on unknown cultural resources from natural processes, such as sediment loads deposited on the Gulf floor from major river systems, and bottom disturbance caused by the constant shifting of currents and transgressing sea level changes. Such effects along with biological and chemical agents common to the marine environment can contribute to the preservation as well as the destruction of cultural resources. Likewise, commercial fishing and other people related activities are continuously interacting with the seafloor of the Gulf and are potentially altering the contextural relationship of any exposed and unknown archaeological assemblages on the bottom or contributing to the build up of metallics on the seafloor.

Should this proposal proceed and development occur, the effectiveness of subsequent efforts to locate lost historical resources in the central and western Gulf will be compromised. This is of greatest concern on nearshore tracts where the probability of encountering lost maritime wreckage is greatest.

In conclusion, there is only a very small possibility that a significant and known cultural resource would be affected if all tracts in this proposed sale were leased, explored, and developed. Should this low probability occur, any damage caused could be lasting and significant. When this proposal is considered in combination with past leases and probable future offshore oil and gas lease sales the potential for impact, especially on unknown submerged cultural resources increases. With over 15,000 wells drilled and 10,000 miles of pipeline laid it is likely that some interaction with significant cultural resources has occurred and been unknowingly damaged.

D. COMMERCIAL FISHERIES

Offshore oil and gas operations impact commercial fisheries in the following ways: removal of sea floor from use; underwater obstructions; oil pollution (chronic or accidental); and pipelines.

Since the majority of shrimp and commercial bottom fish are caught by dragging large trawls across the sea floor, sites occupied by drilling or production platforms and attendant service boats and barges must be avoided. If the structures are jack-up drilling rigs or permanent production platforms, the area of the sea floor removed would amount to one or two hectares for each structure. In deeper waters (over 91 meters) a semisubmersible drilling rig with its anchoring system would occupy from 66 to 92 ha (assuming 457 to 637 m anchoring radius). Trawling depths range from approximately 9 to 91 m; therefore, structures positioned beyond the 91 m depth would have a minimal impact on trawling operations. The duration of exploratory drilling ranges from approximately 45 days for a single well to around 6 months for mutiple well explorations. Permanent production platfórms may remain in place for 10 to 30 years.

The probability that permanent platforms will be erected on any leased tract, based on past exploration success rates, is about 32 percent for offshore Louisiana.

A platform would cover approximately one hectare of seafloor and allowing an additional hectare as a navigational safety zone, a platform would remove approximately two hectares of seafloor from use by trawlers. The number of new platforms expected from this proposed sale ranges between 10 and 25, therefore, the maximum area denied fishermen would be 50 hectares for the duration the platforms are in place.

There exists the possibility of fishing boats colliding with structures. A Coast Guard summary for the period July 1, 1962 through June 30, 1973 reported ten collisions of fishing boats with offshore structures. Causes of these collisions were personal neglect aboard fishing boat (5), equipment failure on boat (1), equipment failure on rig (3), and insufficient and improper lighting of rig (1). There was only one injury; total damage to boats amounted to $151,000 and damage to platforms $24,000.

It is obvious that commercial trawling may be adversely affected to some degree for the next few years because of reduction in trawlable grounds; however, the extent of this is not known but will be more cumulative in nature. There are no data to indicate that offshore exploration is responsible for any decline in catches. There is reason to expect that with an increase in the number of platforms, the chance for increased fishing boat collisions with these platforms will result; however, this is unquantifiable.

Underwater obstructions may cause problems to trawlers. The obstructions referred to here are submerged well heads, pipelines, underwater stubs, and large pieces of debris which, when snagged, may cause damage to trawl nets.

Pipelines permitted by the Bureau of Land Management are required to be buried 3 feet beneath the mudline out to a water depth of 61 m (200 ft.). Pipeline burial is not required in greater water depths. The BLM has records of only two instances of shrimp trawl hangs on offshore pipelines. One of these was hung on a side tap valve of a buried pipeline, which became exposed. At the present time, with so few reports of trawls encountering pipelines, burial of pipelines in waters deeper than 61 m (200 ft.) does not appear warranted.

Pipelines typically are installed by lay barge or reel barge and buried by jetting in water depths less than 200 feet. During construction, the barges use a number of anchors to maintain position and to move ahead as the line is constructed. Generally, two are placed in front, two in back and two anchors are placed to each side. The length of cable to each anchor is dependent on water depth, but may be up to several thousand feet in deeper water. In a "worst-case" situation, as much as 1650 acres of seafloor might be temporarily inaccessible for trawling during a pipe laying operation. If good seamanship is observed, there should be little conflict with trawl fisheries.

As previously stated, Coast Guard regulations require that stubs be marked by a lighted buoy at the surface if there is less than 26 m of clearance. Stubs with clearance of between 26 and 61 meters must be buoyed; however, a lighted buoy is not required. These buoys are frequently missing despite regular maintenance and replacement. Also, in water depths of 26 to 61 m, if the stub is covered by a bonnet, then it need not be marked by a buoy.

Another safeguard has been the plotting of these stubs on navigation charts for vessels with accurate navigational equipment.

Large pieces of debris, such as equipment, piping, structural members, tools and the like, may accidentally be lost off a platform, service boat or barge. If this occurs near a platform it may be located by divers and retrieved as specified in OCS Order No. 8. However, if it is lost from a boat or barge underway, the location may not be known accurately enough to allow its subsequent recovery.

Dr. J. T. Thompson, investigating for the Gulf Universities Research Consortium (1974) found no evidence to indicate either harmful or beneficial effects of the placement and maintenance of offshore oil platforms on the bottom fisheries on the open shelf. His study included: croaker, spot, scup, cutlassfish, sea catfish, seatrout, ground mullet, lizard fish, blue crabs, and brown and rock shrimp. The period (1950–1965) saw the rise of the offshore oil industry in the study area. Dr. Thompson stated that no trends were apparent in either quantity or distribution of species studied.

Oil spills could have both short- and long-term impacts on commercial fisheries; however, no measurable effects have been observed for chronic or accidental spills of oil. Oil spills may physically prevent fishing in contaminated areas. Adult finfish are not normally killed outright, but possibly could suffer a long-term decline due to lowered resistance to disease and environmental stress. Larval and juvenile fish could be killed in great numbers if a spill reached spawning or nursery grounds. Many fish not destroyed may be contaminated with hydrocarbons and be unmarketable. Shellfish are more susceptible to contamination because of their inability to escape and their general filter feeding habits. Many larvae and juveniles could be killed outright. Survivors could be contaminated and unmarketable for long periods.

Presently under development by National Ocean Survey and BLM is a program to chart all major offshore pipelines and flow lines. Several charts for regions of the Gulf of Mexico have now been issued.

Platforms are sites of marked increase in biomass due to the "reef effect," over one to two orders of magnitude higher than other biotopes (table 42). Components of this increase are the fouling community and the fish they attract which are responsible for this portion of the economically important sports and commercial fishery.

Commercial trawlers would probably be affected by this proposed sale, by the reduction of the trawling area. The effect that this would have on catch is unknown. However, there is no evidence to indicate it would be measurable. Underwater obstructions and pipelines would also affect trawling operations. The pipelines that are anticipated to result from this proposed sale would be tie lines to a main line. These lines would also be in a developed area as well as being buried to

Table 42
Biomass Comparison

	Timbalier Bay	Platform 54A	Offshore Control
Organic Carbon in water	8.3-14.5 gm/m^3	5.8 gm/m^3	5.1 gm/m^3
Hydrocarbons in water*	6.2 mg/m^3	3.3 mg/m^3	1.2 mg/m^3
Hydrocarbons in surface film	not studied	0.21-1.27 mg/100 grams	0.12-1.27 mg/100 grams
Hydrocarbons in sediments	161-341 mg/100 grams	145-412 mg/100 grams	145-412 mg/100 grams
Primary Productivity	not studied	1.07 gms/m**/day	1.03 gms/m**/day
Amphipods	8.75 gm/m**	24.2 gm/m**	17.7 gm/m**
Zooplankton	0.02-0.2 gm/m^3	0.3 gm/m^3	0.3 gm/m^3
Polychaetes	0.3-5.0 gm/m**	not studied	NA
Platform growth	NA	3000 gm/m** pile surface	NA

Source: GURC, 1974.

Notes: *Hydrocarbons from all sources, including petroleum, organic detrius, plankton, etc.

**Substantially higher offshore Louisiana than other regions investigated in the open Gulf and offshore Florida.

0.9 m below the mudline out to a water depth of 61 m.

Several tracts that have an oil potential are located near shore. If an oil spill resulted there is a possibility that the oil could enter estuaries. If this were to occur during spawning this could result in death of the larvae in that particular area. However, since the range of these fish are Gulf wide, the total impact on the species would be minimal.

The cumulative effects of this proposed sale would be minimal in view of the present production rate in the Gulf of Mexico.

e. TRANSPORTATION

The discussion of impacts of OCS activities on transportation can conveniently be divided into three areas: marine transportation, air transportation, and ground transportation. Marine and air transportation are more directly impacted by OCS activities, both by the physical presence of offshore structures and by the increased air and boat traffic required to transport personnel, equipment and supplies between onshore facilities and offshore rigs and platforms.

Ground transportation impacts are essentially secondary in nature involving both worktrips and the movement of supplies and equipment from manufacturing and/or warehouse locations to service and supply base locations.

(*1*) *Marine transportation*

(A) SHIP TRAFFIC AND NAVIGATION

In the Gulf of Mexico safety fairways have been established for the safe passage of vessels. Consequently, placement of rigs or platforms are prohibited within the fairways. Platforms and structures are allowed in anchorage areas, but there are restrictions on the distance between them. According to the Corps of Engineers, the minimum distance between structures or drilling complexes is 2 miles. While the placement of structures or rigs within achorage areas would reduce the availability of anchorage to vessels, the practice has been rare and poses a minimal impact to vessel anchorage availability. However, ships do not always use these fairways nor are the fairways available for use everywhere. Some vessels may have to traverse unprotected waters. Since many tracts are leased beneath safety fairways there will be structures directly adjoining safety fairways so that the resources located beneath the fairways may be obtainable through directional drilling. Any navigational error in the vicinity of these tracts could result in a collision. Impacts which could result include loss of human life, spillage of oil, and release of debris including part of or the entire drilling rig and/or ship, if it sinks. The contents of the ship's cargo could cause a serious threat to the environment if it includes toxic materials, such as chemicals, crude oil or refinery products.

A marine casualty is any casualty involving a vessel other than a public vessel, if such casualty occurs upon the navigable waters of the United States, its territories or possessions, or any casualty involving a United States vessel regardless of the location of the casualty. Casualties involving commercial vessels are required to be reported to the U.S. Coast Guard whenever the casualty results in any of the following: actual physical damage to property in excess of $1,500; material damage affecting the seaworthiness or efficiency of a vessel; stranding or grounding; loss of life; or injury causing any person to remain incapacitated for a period in excess of 72 hours, except injury to harbor workers not resulting in death, and not resulting from vessel casualty or vessel equipment casualty.

Vessel casualties involving fixed structures in the Gulf of Mexico during the 11 year period from July 1, 1962 through June 30, 1973 involved eight incidents with vessels over 1,000 tons and 22 incidents with vessels less than 1,000 tons. Of those less than 1,000 tons, 7 vessels were between 100 and 650 tons; while 15 vessels were less than 100 tons.

Using the criteria that damage of $100,000 or greater is significant, there were six incidents during the 11 year period. Four of these involved rigs and two involved ocean going freighters. One structure and one fishing vessel were reported as total losses from collisions during this period.

Judging from the data available for the FY 74-77 reporting period, instances of collision with fixed structures appear to be increasing. There were 15 incidents of collisions with structures in the Gulf of Mexico involving numerous vessel types including foreign flag cargo and tank vessels, a U.S.-inspected cargo vessel, fishing vessels, offshore supply vessels, a tug boat, and other miscellaneous craft. Although no loss of life was reported during the 1962-1973 period, seven deaths from collisions with structures were reported during the FY 74-77 period. Six deaths resulted from the collision of the GLOBTIK SUN with structure WC 534A. The seventh death was the result of the collision of a fishing vessel with a structure.

Damages exceeding the $100,000 criteria were reported for four of the FY 74–77 casualties. Two of these included the GLOBTIK SUN and the above mentioned fishing vessel. The remaining casualties reported $29,000 or less in total damages (vessel, structure, and property).

The fishing vessel incident resulting in one death also resulted in the total loss of the vessel as did the GLOBTIK SUN incident result in total loss of both vessel and structure. The only pollution reported for this period resulted from the GLOBTIK SUN incident (USCG, 1979).

Floating trash accidentally lost off platforms also constitutes a hazard to boats. Damaging collisions can result between small fast boats and floating drums, cans and wood. The screws of all sizes of motor boats and vessels can be fouled on floating plastic sheeting, and plastic or nylon ropes. The extent of this problem is unknown.

Crew and workboat operations between onshore service bases and offshore rigs and platforms will result in the increased use of waterways by marine traffic. While is has been assumed that up to 48 such boats may be operating during the exploratory drilling phase, and that up to 100 such boats may be operating during the production drilling phase, any estimation of the impact such traffic would have on existing marine traffic would be meaningless in the absence of information as to the number of trips/day/boat. Therefore, the magnitude of this impact cannot be estimated at this time. It should also be noted that since this proposed sale will occur in a highly developed OCS area, economies of scale would probably result in far fewer water craft being used since one boat could service several rigs or platforms. Increases in traffic could, however, result in harbor congestion, increased collisions, spills, and personal injury should such traffic increases be concentrated in one area. Additionally, watercraft engaged in seismic and other analyses, and exploratory vessels not travelling in customary directions, slow moving barges and pipe laying barges may cause commercial fishing vessels and/or other vessels to alter course, thus causing inconvenience.

Stationary offshore structures such as rigs and platforms may function as navigational aids for small boat operators, and thus have a beneficial impact. Also, in Louisiana, lives have been saved by the presence of offshore platforms when pleasure and commercial boat crews and passengers were forced to abandon their craft during storms or following boating accidents.

(B) PORTS AND HARBORS

No new service facilities are expected to locate in the proposed sale area; it is anticipated that activities resulting from this proposed sale will be serviced from existing facilities. Ports associated with these existing facilities will experience a positive impact by the increased and/or continued usage of facilities developed as a result of ongoing OCS activities. Increased boat traffic may occur and result in increased harbor congestion and associated safety hazards.

(2) *Air transportation*

Airport facilities should not be impacted during exploratory drilling since it is estimated that no more than 25 helicopters would be required at this time since helicopter operations are expected to primarily occur between onshore service bases and offshore rigs. During production drilling and subsequent phases, it is anticipated that helicopter operations would also originate from company operated heliports and service bases. Therefore it is expected that airports will not be impacted as a result of helicopter operations.

(3) *Ground transportation*

(A) HIGHWAYS

Highways can expect minor impacts due to increased traffic caused by the movement of equipment and supplies. While some trucking will undoubtedly occur, most heavy equipment will probably be transported by barge. Local roads will be impacted somewhat in the vicinity of supply bases as supplies, equipment and personnel are moved in and out. Impacts, though minimal, will be most evident during the production drilling phase as activity intensifies.

(B) RAILROADS

While it is expected that some equipment will be transported by rail, impacts will not be significant in that existing service levels should be adequate to accommodate increases in rail traffic. During the exploratory drilling phase, rail traffic levels should not increase beyond the level attained as a result of previous sales. Traffic would be expected to increase during production drilling and then decline during the production phase.

2. Other Socioeconomic Factors

a. POPULATION

The population changes that may result from this proposed sale are summarized below. These estimates are based on computations utilizing the Multiregional, multi-industrial forecasting model developed by Dr. Curtis B. Harris, Jr., of the University of Maryland, and based on specified inputs prepared by the New Orleans OCS Office (table 43).

Since St. Mary Parish, Louisiana and Brazoria County, Texas were specified as the principal points of investment and employment that may be produced by this sale the principal population impacts occurred in these counties.

This population impact is considered to be a small incremental addition to the population in the region.

Since present population patterns are, in part, a reflection of the present oil and gas related activity the cumulative impacts of this sale would be a continuation of the existing patterns.

Although the wide dispersion in the geographical location of the tracts offered for this proposed sale suggests that the impacts will be also widely dispersed, three scenarios were prepared utilizing the high median, and low resource estimates provided by the U.S.G.S. The scenario incorporating the median resource estimate is considered the ''most likely'' case.

These scenarios are developed from data generated by the economic forecasting model constructed by Dr. Curtis B. Harris, Jr. of the University of Maryland. This data generated by the Harris Model was originally used in the FES Sale No. 51. The data was then re-worked using assumptions given by the Geological Survey for this proposed sale. In this manner, quantification of some of the expected impacts can be measured because the onshore impacts are very similar to those for Sale 51.

A basic assumption incorporated into the computations is that the processing of natural gas and crude oil in the Gulf of Mexico region will require additional volumes of imported crude feedstocks, and that increased domestic production will displace an equal volume of these projected imports. The estimated employment postulated for the most likely scenario is shown in table 44 .

b. HOUSING

The economic forecasting model of Dr. Curtis Harris of the University of Maryland uses location analysis to predict total economic impacts given an initial input of direct impact from this proposed sale. The direct impact will be in terms of offshore and onshore workers engaged in finding and producing oil and gas, plus the investment necessary to explore for, produce and transport the oil and gas associated with this sale. Induced impacts come from the added economic growth induced by direct impacts.

The median scenario assumes a median discovery of oil and gas from resource estimates furnished by the U.S. Geological Survey. The total impact of this scenario in terms of population and required housing is summarized in table 45.

It can be observed from table 45 that the initial impact will be high, then drop after 1993. These impacts result from migrating employees, their families, and the personnel (and their families) needed to service the people directly engaged in OCS activity.

c. EMPLOYMENT

The direct employment resulting from the median resource assumptions amounts to 444 in the year 1981, increases to 1472 in the year 1985, decreases to 392 in the year 1989, remains at this level until the year 1991, and declines to 383 by the year 1994, the last year of active operations (table 44).

Based on computations obtained by the use of the Harris Multiregional, multi-industry forecasting model, the total employment (direct and indirect) rises to 4060 in 1985, declines to 1816 in 1989 and drops to 1478 during the remaining 4 years of the project. The relationship between the number of directly employed persons and the total employment amounts to about 1.39 total employment for each person employed directly, based on a comparison of estimated peak direct employment, and the maximum computed total employment (table 46).

Some further consideration may be given to the negative employment impacts noted above. For example, during the year 1989, projected employment change in Alabama is 9. During the same year, the unemployment is also down by 3, and therefore the total labor force decreases by 6 persons. The decline in labor force was projected to

Table 43. Population Effects (Median Scenario)

	1981	1985	1989	1993
Alabama	-1	-8	-16	-153
Louisiana	724	3438	1236	1386
Mississippi	-2	2	-5	-8
Texas	627	5470	3297	2897
Region	1352	8925	4536	4149

Table 44. Direct Employment (Median Scenario)

Year	Exploration	Development Drilling	Production Platforms	Pipeline Laying	Onshore Base	Total
1981	339	65	22		18	444
1982	791	130	66	11	18	1,016
1983	1,130	130	110	22	18	1,432
1984	1,017	130	176		18	1,341
1985	1,017	195	242		18	1,472
1986		260	308		18	586
1987		260	374		18	652
1988		195	374		18	587
1989			374		18	392
1990			374		18	392
1991			374		18	392
1992			374		9	383
1993			374		9	383
1994			374		9	383

Table 45. Population and Housing Impact Estimates (Median Scenario)

	Year			
	1985	1989	1993	1997
Additional Population				
Region	11,723	4,535	4,149	81
St. Mary Parish, Louisiana	1,821	893	915	22
Brazoria County, Texas	2,154	1,791	2,176	57
Additional Housing Requirements 1/				
Region	4,113	1,592	1,456	29
St. Mary Parish, Louisiana	638	313	321	8
Brazoria County, Texas	756	698	764	20

1/ Using a national ratio of 2.85 persons per occupied dwelling unit from U.S.D.C., Bureau of Census, 1974.

Table 46. Summary of Employment Impacts (Median Scenario)

Coastal Area	1981	1985	1989	1993
Alabama	1	-3	-9	-11
Louisiana	312	1,464	441	354
Mississippi	-1	3	-2	-3
Texas	305	2,589	1,380	1,131
Region	619	4,060	1,816	1,478

continue until approximately 1993, and was accompanied by decreases in both employed and unemployed persons. During these years, there was no change in the number of jobs in the Alabama petroleum mining, petroleum refining, or chemical and plastics industry. The largest decrease in jobs occurred in the sectors of Finance, Insurance, and Real Estate (82, 83), retail stores (85, 89-91, 94-99), medical and education institutions (88), and state and local governments (101).

Concurrently with this effect on the workforce, employment, and unemployment in Alabama, the civilian work force within the State of Louisiana is projected to increase during the period 1981 to 1993. During this same period, the number of civilian persons employed as a result of the sale ranged from 312 to 1464. These changes are believed to reflect the changes in investment and employment specified by the locations selected in the input data, and selection of other sites would have produced different patterns.

It is difficult to determine if these hypothesized changes would have an effect that could be judged either beneficial or harmful. In the event that migration took place from an area of overloaded infrastructure into an area with an existing infrastructure that could accommodate the additional workers the result would be a decrease on the regional infrastructure requirements, and if the migration was to an area with an infrastructure that could not accommodate an addition to the workforce, the result could be an increased need for commercial and public facilities in the region.

With reference to the median scenario, the total workforce changes that may result from this proposed sale are given in table 47.

The employment effects of this sale are a small percentage increase in employment in the location selected as the most likely area for sale related employment, investment, and processing point for sale related products.

The cumulative employment impacts would be a continuation of the employment patterns existing in the Gulf of Mexico region.

d. INCOME

The impact of this proposed sale on earnings in the states of Alabama, Louisiana, Mississippi, and Texas is positive for the region as a whole. The principal positive increase in earnings was noted in Texas, particularly Brazoria County (table 48).

The principal impact on potential earnings anticipated from this sale was projected in St. Mary Parish, Louisiana and Brazoria County, Texas.

The effect of this proposed sale is seen as an increase in earnings in the region hypothesized as the principal area for employment, investment, and landing point for oil and gas that may be found as a result of this proposed sale.

The cumulative impact of this proposed sale and related activities will be a continuation of the existing earnings patterns in the region.

e. ATTITUDES

Since this proposed sale would be an incremental addition to the existing oil and gas related activity in the Gulf of Mexico region, no impact on attitudes is anticipated.

f. EXISTING ECONOMIC INFRASTRUCTURE

Although some shifting of workforce and population in response to employment opportunities are anticipated as a result of this proposed sale, these changes are of a small nature, generally less than two percent changes in the region most subject to impact.

The cumulative changes that have occurred in the Gulf states have resulted in existing economics oriented toward marine oil and gas operations to some extent, and to onshore oil and gas operations in each of the states. This proposed sale will permit the continuation of the existing economic organization.

g. GOVERNMENT PLANS, POLICIES, AND RESTRICTIONS

The incremental additions resulting from this proposed sale should not result in material impact on plans, policies, and restrictions.

E. Alternative Development Scenario

There is a certain degree of uncertainty attached to exploratory operations on the Outer Continental Shelf. Some of the uncertainty is due to lack of precise knowledge as to the composition and location of any oil and gas reserves that may be discovered.

Additional scenarios incorporating different assumptions were specified in order to obtain some concept of the variations that might result from varying levels of operations initiated as a result of this proposed sale. The maximum and minimum scenarios, discussed below, incorporate several assumptions that differ from the "medium" scenario discussed earlier in this section.

Table 47. Estimates of Civilian Labor Force (Median Scenario)

Area	1981	1983	1989	1993
4 State Coastal Region	622	4,282	2,105	1,827
Jefferson Parish Louisiana	76	575	322	187
St. Mary Parish Louisiana	75	523	337	343
Brazoria County Texas	107	748	899	966
Harris County Texas	146	1,470	399	163

Table 48. Total Income Impacts in $1000 1972 Dollars (Median Scenario)

State		Year	
	1985	1989	1992
Alabama	-89	-237	-370
Louisiana	27,367	7,857	7,627
Mississippi	4	-110	-116
Texas	40,713	20,151	18,223
Region	68,068	27,728	25,427

Higher estimates of recoverable oil and gas imply more wells, platforms, pipelines and associated employment.

The direct employment associated with the maximum scenario ranging from 926 in 1981 to 2318 in 1983 and then stabilizes at 576 until 1994 and declines thereafter (table 49).

The total employment associated with this scenario grows from 1285 in 1981 to 4958 in the year 1985, and climbs with increased growth in the impacted counties. The relationship between the direct employment in the year 1985 (1790 persons) and total employment in 1985 (4938) is 2.76, indicating that for each person directly employed, an additional 1.76 persons would be employed as a result of the sale related activities and associated population and personal income changes (tables 51 and 52). Lower estimates of recoverable crude oil may imply that certain tracts or groups of tracts may not contain sufficient reserves to economically justify the installation and operation of a crude oil pipeline from the producing areas to existing pipelines and then to shore terminals. One possible transportation system would be the gathering and storage of petroleum liquids on a platform within the production area, and transportation by barge to an existing onshore marine terminal, while other areas would still use pipelines.

Transportation by barge from the production areas to shore terminals implies an increase in marine traffic, and a reduced requirements for pipeline installation. Daily production rates of 8,500 barrels per day imply on site storage for 17,000 barrels of liquids and an additional daily barge trip from the platform to the onshore location. This would be an incremental increase in barge traffic resulting in a potential increased rate of oil spillage, even though production rates are lower.

The direct employment associated with the use of the minimum scenario ranges from 226 in the year 1981, increasing to 827 in the year 1985, declining to 220 in the year 1988 and then declining to 55 during 1992, the last year of operations (table 49).

The total employment associated with this scenario ranged from 2281 in the year 1985 and declined to 212 in the year 1993 (table 50). The relationship between the direct employment in the year 1985 (827 persons) and the total employment in the year 1985 (2,281) is 2.8, indicating that for each person dirctly employed, an additional 1.8 persons would receive employment as a result of the sale related activities.

Comparison of the values computed for this scenario with the values computed for the median scenario reveal a similar pattern of employment and population shifts, but of a lesser magnitude. Tables 51 and 52 for population and personal income impacts.

The volume of mud materials and drill cuttings would be reduced to a level approximately equal to 38 percent of the amount produced by the high scenario. Approximately 30 acres would not be required for platforms, and pipeline disturbance would be reduced from more than 3 million cubic meters to approximately 0.8 million cubic meters. The probability of oil spills from OCS operations would be reduced by approximately the percentage difference in the amount of oil. However, lower resource finds imply greater use of imported crude oil, and a greater risk of tanker related spills, as well as the possibility of increased tanker traffic resulting in a collision with an existing structure.

Reduced requirements imply reduced probability of impact on the biota of the Gulf. By reducing the estimates of volume of production, platforms, pipelines, etc., the impact estimates on the various resources would be similarly reduced. For example, less oil production reduces the chances for an oil spill, thereby reducing the probability of adverse impacts on fisheries, benthos, reefal systems, recreational areas, and endangered species.

On the other hand, increased barge transportation of crude oil predicted as a result of a lower amount of discovery and development may cause an increased rate of oil spillage as a result of barge leakage, groundings, or collisions. There would be an increased potential risk of oil spills to beaches, estuaries, and bird populations in the vicinity of this increased barge traffic transporting crude oil to shore.

A greater use of tankered imported crude oil would increase the chances of conflict with navigation. Increased tanker traffic likewise increases the risks of collisions and associated environmental impacts.

Table 49. Direct Employment (Minimum and Maximum Scenarios)

Year	Exploratory Drilling Min.	Exploratory Drilling Max.	Development Drilling Min.	Development Drilling Max.	Production Platforms Min.	Production Platforms Max.	Pipeline Laying Min.	Pipeline Laying Max.	Onshore Employment Min.	Onshore Employment Max.	Total Min.	Total Max.
1981	226	791	0	65	0	44				26	226	926
1982	452	1130	65	195	22	110				26	539	1461
1983	565	1921	65	195	44	176				26	674	2318
1984	565	1130	65	195	88	264	22	22		26	740	1637
1985	565	1130	130	260	132	352		22		26	827	1790
1986			195	390	176	440				26	371	856
1987			195	390	220	550				26	415	966
1988			65	260	220	550				26	285	836
1989					220	550				26	220	576
1990					220	550				26	220	576
1991					110	550				26	110	576
1992					55	550				26	55	576
1993						550				26		576
1994						550				26		576
1995						275				26		301
1996						138				13		151

Table 50. Total Employment Impacts (Minimum and Maximum Scenarios)

State	1981 Min.	1981 Max.	1985 Min.	1985 Max.	1989 Min.	1989 Max.	1993 Min.	1993 Max.
Alabama	0	1	-2	-4	-5	-14	-2	-17
Louisiana	159	647	822	1780	247	648	51	533
Mississippi	0	-1	2	3	-1	3	0	-5
Texas	155	634	1455	3148	775	2028	162	1701
Region	315	1285	2281	4938	1019	2669	212	2223

Table 51. Total Population Impacts (Minimum and Maximum Scenarios)

	Year							
	1981		1985		1989		1993	
State	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Alabama	0	-1	-5	-10	-9	-24	-21	-230
Louisiana	368	1503	1932	4181	693	1816	173	2084
Mississippi	-1	-4	1	2	-3	-8	-1	-12
Texas	319	1302	3073	6651	1850	4845	416	4357
Region	688	2808	5014	10853	2545	6665	596	6239

Table 52. Total Income Impacts (Minium and Maximum Scenarios)
(in thousands of 1972 dollars)

	Year							
	1985		1989		1993		1997	
State	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Alabama	-50	-108	-133	-348	-53	-557	0	-88
Louisiana	15375	32278	4409	11545	1095	11471	0	3364
Mississippi	2	-5	-62	-162	-17	175	0	-18
Texas	22873	49507	11310	29611	2830	27406	0	7771
Region	38241	82772	15562	40744	4027	38240	0	11057

Section IV

Mitigating Measures

A. Operations

1. Regulations

Regulations governing lease operations on the OCS, which are administered by the Geological Survey, appear in 30 C.F.R. Part 250. A summary of those sections of the 250 regulations which serve to mitigate the impacts of the activities associated with the proposed lease sale follows.

a. EXPLORATION AND DEVELOPMENT/PRODUCTION PLAN APPROVAL REGULATIONS

No exploration, development or production may commence on any OCS lease, including leases in the Gulf of Mexico, until an exploration and a development/production plan have been approved by the Geological Survey. Regulations requiring the submission of an exploration and development/production plan were first published by the Geological Survey on January 27, 1978 (43 Fed. Reg. 3880) at 30 C.F.R. 250.34. In September of 1978 the Amendments to the OCSLA were enacted. Sections 11 and 25 of the revised statute establish processes for the submission, evaluation and approval of exploration plans and development/production plans. Because of these new provisions it was necessary to temporarily suspend certain portions of the original regulations pending full implementation of the new law (see 43 Fed. Reg. 50903, November 1, 1978). The Department is now in the process of revising the Section 250.34 regulations to conform to the new statutory provisions. Proposed revisions appear at 44 Fed. Reg. 3513 (January 17, 1979). It is anticipated that final regulations will be promulgated by June 1979.

Section 250.34-1 of the proposed regulations describes the procedures a lessee must follow to obtain approval of proposed exploration activities and the criteria which will be used to approve, disapprove or require modifications of a plan. The plans must include a schedule of anticipated exploration activities, a description of the equipment to be used, and explanation of the location of wells to be drilled and other relevant information. Except in the Gulf of Mexico, a plan must be accompanied by an Environmental Report. In the Gulf of Mexico (except off the coast of Florida) Environmental Reports are not automatically required unless the proposed activities would affect a State with a coastal zone management program approved pursuant to the Coastal Zone Management Act (CZMA) (16 U.S.C. 1451-1464). However, even where this Gulf of Mexico exemption is applicable, the Director may request a complete Environmental Report or specific environmental information in lieu of the report where such information is necessary to enable the Director to make required findings under the Act or under NEPA. The Department will approve, disapprove or require modifications of an exploration plan within 30 days of its submission. The plan must be disapproved if any activity described in the plan would probably cause serious harm or damage to life, property, mineral resources, national security or defense, or the marine, coastal or human environment, and the harm or damage cannot be avoided by modification of the plan. If the Secretary disapproves a plan, he may, under certain circumstances, cancel the lease and compensate the leaseholder. The availability of the plans for review and comment is described in the proposed rules.

Section 250.34-2 of the proposed regulations creates a process for the approval of development/production plans. All OCS lessees, including those leasing in the Gulf of Mexico, must submit a development and production plan which describes the activities to be conducted on the lease related to development and production of the oil and gas resources. Except for plans submitted for leases in the Gulf of Mexico other than off the coast of Florida and certain other areas covered by the statutory exemption, an Environmental Report must accompany the plan submission. However, even where the exemption is applicable, an Environmental Report will be required if development and production would affect a State with an approved CZM program or if the Director of Geological Survey needs the Environmental Report or other environmental information to make findings required by the Act or by NEPA.

The approval process created in the proposed regulations includes a 60-day comment period for the Governors of affected States and executives of affected local governments. Approval, disapproval or an order requiring modification of the plan must occur within 60 days of the close of the comment period unless approval would require preparation of an Environmental Impact Statement, in which case the timeframes established for compliance with NEPA would apply. The proposed regulations set forth in detail the criteria which the Director will use to determine the acceptability of a plan. A plan must be disapproved if (1) State concurrence with the consistency certification has not been received or the State objects to the consistency certification and the Secretary of Commerce does not overrule the objection; (2) activities described in the plan threaten national security or national defense; or (3) exceptional circumstances exist which would probably cause serious harm or damage to life (including fish and other aquatic life), to property, to any mineral deposits (in areas leased or not leased), to the national security or defense, or to the marine, coastal, or human environment, and the threat of harm or damage will not disappear or decrease to an acceptable extent within a reasonable period of time.

At least once in each area or region, excluding the Gulf of Mexico, the Secretary must declare approval of a plan to be a major Federal action and prepare an environmental impact statement following NEPA procedures.

b. Pooling and Unitization Regulations

The Secretary has a broad mandate in Section 5 of the OCSLA to provide for the prevention of waste and the conservation of the natural resources of the Outer Continental Shelf. A commonly used nethod of insuring resource conservation is pooling or unitization which results in the joint development of oil or gas resources underlying separate tracts. Section 30 C.F.R. 250.50 grants the Director of the USGS the authority to demand pooling or unitization of leased lands. 30 C.F.R. 250.51 references to the unit plan regulations contained in 30 C.F.R. 226 concerning approval of units or cooperative agreements. Part 250.52 explains the purposes for which pooling and unitization may be approved. Because of changes in the 1978 Amendments to the OCSLA, proposed regulations revising the unitization procedures will be published in the near future.

c. Air Quality Regulation

The Outer Continental Shelf Lands Act Amendments of 1978, provide that the Secretary of the Interior shall prescribe regulations with provisions "for compliance with the national ambient air quality standards pursuant to the Clean Air Act (42 U.S.C. 7401 *et. seq.*), to the extent that activities authorized under this Act significantly affect the air quality of any state" (Section 5(a)(8), 43 U.S.C. 1334). By notice of December 28, 1978, public comments were requested on questions contained in an Advance Notice of Proposed Rulemaking designed to assist the Department of the Interior in the identification and selection of a regulatory program to control air emissions on the OCS which significantly affect onshore air quality. Proposed regulations on this subject will appear in the Federal Register in late April of 1979. The Air regulations will apply to all OCS lessees, including those in the Gulf of Mexico. However, actual control of emissions will be required only where the emissions would significantly affect the air quality of any *onshore* area of a State.

d. Suspension of Operations and Lease Cancellation.

Provisions governing suspension of OCS operations and lease cancellations appear in 30 C.F.R. 250.12. Changes in these provisions were necessary as a result of the 1978 Amendments; these revisions are proposed at 44 Fed. Reg. 13527 (March 12, 1979). Final regulations on this subject are anticipated for July 1979.

The proposed regulations provide for the suspension or temporary prohibition of any operation or activity, including production, (1) at the request of a lessee, in the national interest, to facilitate proper development of a lease or to allow for the construction or negotiation for use of transportation facilities, or (2) if there is a threat of serious, irreparable or immediate harm or damage to life (including fish and other aquatic life), to property, to any mineral deposits (in areas leased or not leased), or to the marine coastal or human environment.

The Secretary may cancel a lease or permit if, after a hearing, he determines: (1) that continued activity would probably cause serious harm or damage to life, the environment, national security or defense; (2) that the threat will not timely disappear or decrease to acceptable levels; and (3) the advantages of cancellation outweigh the advantages of continued activity. Cancellation may be done only following suspension or temporary prohibition of activity on a lease or permit continuously for a period of five years (or less if requested by the lessee). Cancellation entitles the lessee to receive compensation as provided by the Amendments.

e. Remedies and Penalties.

A new regulatory provision has been added to the 30 C.F.R. 250 regulations to implement Section 24 of the OCSLA. (See sec. 250.80 of proposed regulations appearing at 44 Fed. Reg. 13527.

The new provisions for the assessment of civil penalties implement policies and establish procedures under which a party can be charged up to $10,000 per day for failing to comply with that party's responsibilities under the law, regulations, or a lease. In the past the law only provided specific monetary criminal penalties in the amount of $2,000 for any knowing and willful violation of the law, regulations, or lease. Under the new law the monetary penalty that can be assessed as a criminal penalty has been increased to $100,000 per violation and there is a provision for imprisonment for up to 10 years. Both a fine and imprisonment can be assesed in the case of a knowing and willful violation under the new law.

Section 23 of the OCS Lands Act (43 U.S.C. 1334), as amended, provides for the citizen suits. Generally, any person having a valid legal interest which is or may be adversely affected may sue any other person, including the United States, for violation of the OCS Act, or any regulation, lease or permit issued under the Act in order to compel compliance. Except in the case where the alleged violation constitutes an imminent threat to the public health or safety or would affect a legal right, a person must give sixty days notice in writing to the Secretary prior to bringing suit. Federal district courts have jurisdiction over cases concerning OCS operations and lease cancellations. The Court of Appeals for the District of Columbia has jurisdiction for cases concerning leasing program approval and courts of appeals in appropriate affected States have jurisdiction over actions concerning exploration and development and production plans. These latter two judicial reviews are available only to persons who participated in administrative proceedings on the specified actions who are adversely and who fulfill other conditions.

2. Summary of OCS Orders—Nos. 1-14

The regulations discussed above are supplemented with Gulf of Mexico OCS Orders Nos. 1 through 14, summarized below.

Proposed National OCS Operting Order No. 1

This Order requires all platforms, drilling rigs, drilling ships, and wells to have signs of standards specifications for identification of the operator, the specific lease block of operation, and well number.

This Order also requires that all subsea objects resulting from lease operations which could present a hazard to other users of the OCS must be identified by navigational markings of a design approved by the Supervisor and not inconsistent with applicable U.S. Coast Guard Regulations. By such marking, other users of the OCS, such as fishermen, tankers, and so forth, will know to stay clear of an area in which their ships, fishing gear, or anchors might foul the underwater objects causing damage to the ship or gear and possible causing a leak of oil or gas by damaging the subsea production equipment itself.

The Order mitigates impacts caused by subsea completions on commercial fishing activities and anchoring and mitigates impacts caused by the presence of platforms or drilling operations on shipping and navigation.

Proposed National OCS Operting Order No. 2

Proposed Order No. 2 concerns procedures for the drilling of wells. it requires the operators to file a drilling application which includes information on the drilling platform or vessel, well casing, mud control, safety training of the operator's personnel, and a list describing critical drilling operations which may be performed. The Order then describes certain procedures or equipment to be used in each phase of the drilling operation.

Due to the technical complexity of the proposed Order, not all details are included in describing its mitigatory impact. This proposed Order requires that drilling platforms and vessels must be capable of withstanding the oceanographic and meteorological conditions of the area; applications must include all pertinent data on the fitness of the platform or vessel and each such drilling structure must be inspected by the GS for compliance with the OCS Orders. The requirement should mitigate concerns about the impact of weather, waves, sediment scour, and currents on offshore drilling units.

Order No. 2 requires operators to conduct shallow geological hazards surveys of the well site or lease block prior to the commencement of drilling opertions. The purpose of such surveys is to locate shallow gas deposits, near-surface faults, obstructions, unstable bottom areas, or other conditions which are hazardous to drilling operations.

All wells must be cased and cemented to support unconsolidated sediments and to prevent leakage of fluids between formations or pressure changes in the well. If there are indications of improper cementing, the well must be recemented and logs run to insure proper sealing of the well. The casing design and setting depths are to be based on all engineering and geologic factors including the presence or absence of hydrocarbons, potential geologic hazards, and water depths. Additional casing strings may be required if abnormal geopressures are encountered. A pressure test is required of all casing strings, except the drive or structural casing, to determine the presence of leaks or inadequate cementing. The use of casing described in this Order should eliminate potential impacts of freshwater zone contamination, lost production, or the possibility of accidents caused by improper well protection.

Operators are required to obtain directional surveys on all wells. These surveys, which are filed with the Supervisor, insure that the well is drilled in accordance with approved specifications.

Blowout preventers and related pressure-control equipment must be installed, used, and tested in a manner necessary to insure positive well control. A specific number of these preventers must be used in every well, and they must be equipped with dual control systems and failsafe valving in critical lines and outlets. These devices provide protection against oilspills resulting from a loss of well control. Special requirements are included for floating drilling operations which necessitate the placement of the blowout preventer stack on the seafloor. These requirements are designed to mitigate the potential for accidents during deepwater drilling operations.

Order No. 2 specifies requirements for the use and testing of drilling muds. Drilling muds have a number of critical functions, one of the most important being the control of subsurface pressures and the prevention of gaseous and liquid influxes into the wellbore. Drilling mud programs must be approved prior to the commencement of drilling. The operator must, at all times, maintain sufficient and readily accessible quantities of mud to insure well control.

Representatives of the operator must provide on-the-site supervision of drilling operations around the clock. A member of the drilling crew or the toolpusher must maintain surveillance of the rig floor continuously from the time drilling operations commence until the well is either completed or abandoned. All supervisory personnel, including drillers, must be trained in present day methods of well control, and records of the training are to be kept at the well site. Specific well-control training requirements are outlined in Geological Survey OCS Standard No. T 1 (GSS-OCS-T 1). The training requirements are intended to minimize the potential for well blowouts caused by human error. Formal training is supplemented with weekly blowout-prevention exercises for all rig personnel. These drills are performed during different drilling procedures to vary the experience of the crew. Drills are frequently witnessed by Geological Survey representatives and must always be recorded in the driller's log.

Procedures to be followed when drilling operations may penetrate reservoirs known or expected to contain hydrogen sulfide gas (H_2S) are included in U.S. Geological Survey OCS Standard No. 1 (GSS-OCS-1), "Safety Requirements for Drilling Operations in a Hydrogen Sulfide Environment." This set of standard operating procedures will assure proper equipment testing and crew training should highly toxic H_2S be encountered. Hazards of H_2S are substantially reduced by the institution of these procedures.

Since some operations performed in drilling are considered more critical than others with respect to well-control problems, fires, explosions, oilspills, and other accidents, each operator must file a Critical Operations and Curtailment Plan for the Supervisor's approval.

This Order includes a list and description of critical operation categories. Before exceeding the operational limits of an approved plan, the operator must notify the Supervisor and curtail operations. This allows the Geological Survey to provide either specific approval in advance of the conduct of the critical operation or to dispatch personnel to the lease site for observation of the operation. This part of proposed OCS Order No. 2 will provide additional regulatory review of drilling operations which may be hazardous to the drilling platform, vessel, crew, and the environment.

Proposed National OCS Operating Order No. 3

This Order is established to provide control of the plugging and abandonment of wells which have been drilled for oil and gas. For permanent abandonment of wells cement plugs must be placed so as to extend 30 meters (100 feet) above the top and 30 meters below the bottom of fresh water and oil and gas zones to prevent those fluids from escaping into other strata. Portions of a well in which abnormal pressures are encountered are also required to be isolated with cement plugs. Plugs are required at the bottom of the deepest casing where an uncased hole exists below. Plugs or cement retainers are required to be placed 30 meters above the top and 30 meters below any perforated interval of the well hole used for production of oil and gas. A "surface" plug 45 meters (150 feet) long must be placed 45 meters or less below the ocean floor. A pressure test must be made on top of the first plug below the surface plug. The spacing between plugs must be filled with drilling muds of sufficient density to exceed the greatest formation pressure encountered in drilling the interval.

The casing and piling on the sea floor must be removed to a depth below the ocean floor approved by the Supervisor. For temporary abandonments, all plugs and mud discussed above must be placed in the well with the exception of the surface plug. (The temporary abandoned well would have to be marked in accordance with proposed Order No. 1.)

This Order should eliminate concern about contamination of freshwater zones or the possibility of oil and gas leaks from abandoned wells. The requirements that the sea floor above each final abandonment must be cleared, and that the removal depth of casing and piling must be examined on a case-by-case basis, will provide protection to navigation and fishery interest. The chance that obstructions might become exposed due to changes in bottom conditions is reduced as well.

Proposed National OCS Operating Order No. 4

Proposed Order No. 4 provides for the extension of a lease beyond its primary term for as long as oil or gas may be produced in paying quantities and the operator has met the requirements for diligent development. If these circumstances should occur, a lease can be extended beyond its initial term pursuant to Section 8(b)(2) of the OCS Lands Act and Title 30 (CFR 250.11 and 250.12(d)(1).

In addition to a production test for oil, one of similar duration is required for gas. All pertinent engineering, geologic, and economic data are required to support a claim that a well is capable of being produced in commercial quantities Each test must be witnessed by the Geological Survey although, with prior approval, an operator affidavit and third-party test results may be acceptable. The primary purpose of this Order is to provide for determinations of well productivity which may permit extensions of lease terms. Such extensions are frequently necessary to insure the orderly development of OCS oil and gas resources.

Proposed National OCS Operating Order No. 5

This Order sets forth requirements for the installation, design, testing, operation, and removal of subsurface safety devices.

Proposed Order No. 5 requires that all well tubing installations open to hydrocarbon-bearing zones shall be equipped with a surface-controlled, subsurface-safety device that is placed 30 meters or more below the ocean floor. All wells perforated and completed but not placed on production must be equipped with a subsurface-safety device or tubing plug within 2 days after the well is completed. Subsurface-safety devices shall also be placed in injection wells unless they are incapable of flowing. All safety devices must comply with the minimum standards set forth in the API Spec. 14A, Second Edition, November 1977, "Specification for Subsurface Safety Valves," and recent supplements as approved by the Area Supervisor. Testing of the device must take place monthly for 6 months after installation and quarterly thereafter; if it does not operate correctly, it must be promptly removed and a properly operating device must be put in place and tested. Additional protective equipment is also required with the use of subsurface protective devices. When tubing is open to hydrocarbon zones and is not equipped with a subsurface-safety device (during workover), the well must be marked, and a safety device or tubing plug must be available at the field location to be installed if necessary. Records must be kept of all subsurface-safety devices employed at each well with quarterly reports prepared on reasons for any failures of the devices.

The subsurface-safety valves prescribed in this Order serve as a mechanism for automatically shutting in a well below the ocean floor in the event of an accident or natrual event which destroys or threatens to destroy surface well-control equipment. The reliability of such devices is maximized through regular testing. As a result of these requirements, the probability of a producible well blowout is extremely small.

Proposed Order No. 5 also sets forth requirements for the design, installation, operation, and testing of safety systems for platform production facilities. All new platforms resulting from this sale will have to be in conformance with API RP 14C, "Analysis, Design, Installation, and Testing of Basic Surface Systems on Offshore Production Platforms."

Prior to the installation of platform equipment, operators must submit, for the Supervisor's approval, schematic diagrams with equipment, piping, firefighting, electrical-system, gas-detection, and safety-shutdown specifications. A Safety Analysis Function Evaluation Chart must also be submitted. This chart relates all sensing devices, shutdown devices, and emergency-support systems to their functions. The chart provides a means of verifying the design logic of the basic safety system. A Safety Analysis checklist is also prepared. This checklist permits an analysis of the system's redundancy and the numbers and types of system failures that would have to occur before an undersirable event would result. The safety analysis procedures prescribed in this Order identify events that might pose a threat to safety or the environment and define reliable protective measures that will prevent such events or minimize their effects should they occur.

All platforms must have curbs, gutters, and drains in all deck areas to collect contaminants in a sump system. This requirement prevents the discharge of such contaminants into the sea.

Whenever operators plan to conduct activities, simultaneously with production operations, which could increase the possibility of accidents, a contingency plan must be filed for the Supervisor's approval. Activities requiring the plan include drilling, workover, wireline, pumpdown, and major construction operations. The intent of this requirement is to permit Geological Survey review of the conduct, control, and coordination of the proposed operations. This review will determine whether the operations can be conducted simultaneously without significantly increasing the risk of accidents or spills.

Prior to welding or burning operations, operators must submit a plan describing personnel requirements and designating safe welding areas. Procedures for establishing safe welding areas and for conducting operations outside such areas are specified in the Order. The requirements reduce the potential for explosions, injuries, and pollution discharges.

To mitigate the potential for accidents resulting from human error, all personnel engaged in installing, inspecting, testing, and maintaining safety devices must meet specific training requirements. The Order also sets forth requirements for employee orientation and motivation programs concerned with safety and pollution prevention in offshore oil and gas operations.

Gulf of Mexico OCS Operating Order No. 6

This Order specifies requirements for the completion of oil and gas wells, including the pressure testing of all wellhead connections. The required practices protect the well from rupture or leakage and reduce the probability of environmental impact from the release of oil and gas.

Proposed National OCS Operating Order No. 7

Proposed Order No. 7 concerns the prevention of pollution to the marine environment and provides rules for the disposal of waste materials generated as a result of offshore operations.

Proposed OCS Order No. 7 sets forth a means to effectively deal with pollution of the marine environment from offshore petroleum operations. It states that the operator must prevent pollution of the ocean and that the disposal of waste products must not create conditions that can "adversely affect the public health, life or property, aquatic life or wildlife, recreation, navigation, or other uses of the ocean."

The operator must submit a list of drilling mud constituents, additives, and concentrations expected to be used; this provides a means to prohibit or alter the disposal and use of specific components which might be harmful to the environment. Muds containing free oil shall not be disposed of into the ocean. The disposal of oilfree muds into the sea must be by approved methods. These requirements greatly reduce the potential impacts on biological communities, water quality, commercial fisheries, and offshore recreation and also mitigate impacts along the coastline which would be caused by the washing of oil, fuel, chemical residues, or toxic substances to shore.

No drill cuttings, sand, or other solids containing free oil are to be disposed of into the ocean unless the oil is removed thus minimizing their potential impacts to water quality and marine organisms. No solid waste materials or debris can be disposed of in the marine environment. The disposal of equipment into the sea is prohibited except under emergency conditions. The location and description of any equipment so discharged must be reported to the Supervisor. This requirement is intended to mitigate the potential for interference with commerical fishing operations.

All personnel must be thoroughly instructed in the prevention of pollution from offshore operations. Rigorous inspection schedules are required for all facilities. Pollution reports are required for all oilspills, and procedures are set forth for the notification of proper authorities. Pollution-control equipment must be maintained or available to each operator. The equipment must include booms, skimmers, cleanup materials, and chemical agents. (Chemical agents may only be used with the consent of the Supervisor in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan.) The equipment must be maintained and inspected monthly.

Operators must submit an oil spill contingency plan for approval by the Supervisor before an application to conduct drilling operations may be approved. The plan must contain provisions for varying degrees of response effort depending on the severity of the oilspill; identification of containment and cleanup equipment availability; notification of responsible persons and alternates in the event of a spill; identification of areas of special bilogical sensitivity; and specific actions to be taken after the discovery of an oil discharge. Should a spill occur, immediate corrective action must be taken.

Drills and training classes for familiarization with pollution-control equipment and operational procedures must be conducted on a schedule approved by the Supervisor. The drills must include the deployment of equipment. Although the emphasis of the OCS Orders is on the prevention of oilspills, it is recognized that spills will occur. It is also recognized that it is not technically possible to completely control and mechanically remove all oil that is discharged. The intent of this portion of the order is to insure that operators have ready access to the best practical control equipment for the area and that personnel are trained to effectively utilize the equipment. The operator's plans must have sufficient flexibility to permit different spill control strategies for different environmental conditions. This provides for mechanical and chemical measures which best compliment the forces of nature and maximize the protection of biological communities, shoreline resources, and commercial interests.

G2Proposed National OCS Order No. 8

The Order sets forth requirements for the design, installation, and protection of platforms and structures. Designs must be in accordance with API. Recommended Practice (RP) 2A, "Planning, Designing, and Constructing Fixed Offshore Structure." Sufficient environmental data must be gathered to permit a determination of design wave, wind, current, tide, temperatures, seismic, and geotechnical conditions. This environmental data must be factored into the design on the basis of the Order's specifications. Structural modifications must be approved by the Supervisor. All structural plans must be certified by a registered professional structural engineer or civil engineer specializing in structural design. This Order assures careful review of platform design and minimizes the probability of spills and environmental damage resulting from structural failure.

Gulf of Mexico OCS Order No. 9

This Order establishes requirements for oil and gas pipelines including pressure sensors, automatic shut-in systems, check values, corrosion protection, and hydrostatic testing. Detailed information on the pipeline design and the bottom conditions must be included in all pipeline applications. Pipelines must be designed to be protected against water currents, storm scouring, and bottom instability. All lines must be compatible with trawling operations and other OCS activities. The effect of the Order is to minimize the potential for conflicts with commercial fishing operations and for oilspills resulting from pipeline ruptures or leaks.

Gulf of Mexico OCS Order No. 11

Order No. 11 establishes procedures for regulating the rate of production from oil and gas wells and reservoirs. The maximum production rate for a reservoir is that rate which will permit economic development without detriment to ultimate recovery. Maximum rates for individual wells are based on surface equipment capabilities, sand and sediment production, gas oil and water oil ratios, location of perforations and type of completions, and prudent operating practices. These requirements will prevent reservoir damage which could reduce the total production from the reservoir and necessitate increased drilling activity. The requirements also reduce the probability of damage to surface production equipment and the chance of oil spillage resulting from such damage.

The Order prohibits the flaring or venting of natural gas except under special conditions approved by the Supervisor. This requirement prevents the waste of natural gas, the cleanest burning fossil fuel. The use of natural gas in urban areas has a positive effect on air quality.

Order No. 11 sets requirements for the location of wells. The Supervisor has the authority to revise well locations for resource conservation or facility-reduction purposes. An approved unitization plan may also be required if it is determined that such a plan is in the interest of resource conservation. In addition to the resource conservation benefits, unitization may serve to reduce the facility requirements for OCS development and the interference with other OCS activities.

Proposed National OCS Order No. 12

This proposed Order sets forth requirements for the public availability of data and records concerning offshore petroleum operations. Under the Order, specific types of data and records pertaining to drilling and production operations, well tests, sales of lease production, accidents, inspections, and pollution incidents are to be available for public inspection. Privileged information such as certain geological and geophysical data would be made available for public inspection with the lessee's consent or after a fixed period of time has elapsed. By making operations data available, this Order permits increased public awareness of OCS activities and involvement in OCS programs. Increased public interest and understanding should result in continuing improvements in the safety and pollution-prevention programs of both industry and Government.

Gulf of Mexico OCS Order No. 13

This Order specifies procedures for assuring the accurate measurement of oil and gas production and for commingling production from different leases or operators. The requirements will permit accurate determinations of Government royalties and an orderly transfer of production between parties.

Gulf of Mexico OCS Order No. 14

Order No. 14 establishes guidelines for the approval of suspensions of production and provides for diligent development of oil and gas resources. The intent of the Order is to allow sufficient time for proper lease development while prohibiting unnecessary delays in the exploitation of OCS resources. The environmental impacts of OCS development are minimized by proceeding in an orderly, well planned fashion.

3. Inspection and Approval Requirements

To enforce the Geological Survey Operating Regulations (30 CFR 250) and OCS Orders, a comprehensive inspection system has been developed.

a. ON-SITE INSPECTION

All operations, regardless of the activity, will receive regular on-site inspection for compliance with regulations and OCS Orders. The Geological Survey uses a systematic program including both scheduled and unannounced inspections to assure the achievement of safety objectives. Floating drilling vessels or drilling units will receive a detailed inspection to insure conformance with regulations and OCS Orders before commencement of drilling operations. These predrilling inspections are comprehensive and often require several days to complete. Also, these rigs will be inspected at least once during the drilling of a well, and all well control, safety, and pollution control equipment will be inspected for proper function.

Permission to either abandon or suspend a well must be granted by the USGS; this includes the setting of all required cement plugs. The cutting of the several casing strings below the sea floor, at which time the casing is removed, will be reviewed by the USGS on a case-by-case basis to ensure that sediment migration will not eventually expose the casing stub.

Well workover and well abandonment phases of OCS operations, as with drilling, will receive both scheduled and unscheduled inspections, depending on the progress of a particular operation. Drill stem testing, cement plugs set prior to redrilling a well, cement plugs set to temporarily or permanently abandon a well, and all casing cementing operations must be approved by the USGS Supervisor.

b. INSPECTION SCHEDULE AND ENFORCEMENT

The inspection program for the Gulf of Mexico OCS area is maintained by the U.S. Geological Survey with the intent that required regulations will be followed to avoid potential hazards to personnel, provide protection for the environment, and preserve the multiple-use concept to the OCS lands. Warnings for incidents of noncompliance are issued and the date of correction of defects are recorded.

Visual inspections of the water surface over OCS pipelines in the Gulf of Mexico operating area are currently made by the operator for evidence of failures and leaks. USGS and operator personnel in this area visit production facilities daily and follow a route approximating the pipeline route.

The U.S. Coast Guard also patrols for oil spills or leaks with vessels and aircraft within territorial and contiguous waters. Occasionally patrols are made within the prohibited zone, normally within 50 miles of land, to enforce the International Convention for the Prevention of Pollution of the Sea by Oil, as amended.

An approved contingency plan is required from each operator in the Gulf of Mexico that includes spill control, containment and cleanup, and measures to be taken if there is any likelihood that hydrogen sulfide gas might be encountered during the drilling operation.

The OCS Lands Act delegates to the Coast Guard the authority to promulgate and enforce regulations covering warning devices, safety equipment, and other matters related to the promotion of safety of life and property on fixed OCS platforms and drilling vessels. The implementing regulations for this delegation are contained in Title 33 of the Code of Federal Regulations, Part 67 and Subchapter N, Parts 140 to 147. Other Coast Guard regulations cover safety equipment on all types of offshore facilities and vessels, specific personnel licensing procedures, and minimum levels for ships and boats, and prohibit the discharge of pollutants from all vessels. The Coast Guard makes regular and routine inspections to ensure strict compliance with their regulations.

c. INSPECTION PROCEDURES FOR SUBSEA SYSTEMS

Subsea systems may possibly be used to produce oil and gas resulting from this proposed sale. Inspections of these systems in the Gulf of Mexico will be in accordance with applicable OCS Orders and USGS policy.

The many Federal agencies involved in the review process of subsea systems include, in addition to the Geological Survey: EPA, Coast Guard, Corps of Engineers, U.S. Fish and Wildlife Service, and the Bureau of Land Management. Except for proprietary parts, plans for exploration and development utilization are available for general public review (Section I.C.3).

d. OPERATOR REPORTS

A comprehensive reporting system covering all oil spills and any unusual conditions (for example, reporting and investigation of a persistent oil slick from an unknown source, such as a sunken ship or natural oil seep) is required by the OCS Orders, and is a key factor in monitoring operations in the Gulf of Mexico. Operators are also required to maintain records for inspection by the Geological Survey of required periodic tests of safety equipment. A digest of these reports and the various forms that are required can be found in the Gulf of Mexico OCS Order No. 12 (Appendix B).

4. Enforcement

The USGS policy is intended to eliminate any noncompliance with lease requirements by the operator that may lead to loss of life, loss of property and resources, or damage to the environment. A standardized compilation of items has been prepared by the USGS, entitled "List of Potential Items of Noncompliance and Enforcement Action" the "PINC" list, which is used for inspection. Should an inspection of drilling and production operations detect hazard pressure situations or pollution, either a written warning will be given that allows the operator seven days to correct the incident of noncompliance (INC), or a shut-in order will be issued. The shut-in order may be applied only to the equipment affected by the incident of noncompliance such as a particular piece of production equipment or a producing zone, or to the entire drilling rig, production platform, or onshore facility, as required.

The cumulative number of warnings issued and suspensions ordered for infractions of OCS Orders which occurred during normal daily inspections are listed in table 53.

During the period of June 1, 1976 through June 30, 1977 there were 5 oil spills of more than 15 barrels reported:

1. Several high level control failures caused 16 barrels of oil to flow into the Gulf from a skim pile.
2. Three hundred barrels of diesel fuel spilled into the Gulf when a loading hose broke while pumping the fuel onto a platform.
3. A shrimp trawl was dragged across the tie-in of Placid's 10 inch pipeline and Pennzoil's 14 inch Bonito pipeline pulling loose a one inch ball valve and nipple allowing 4000 barrels of oil to spill into the Gulf.
4. A mud slide caused the rupture of a 12¾ inch pipeline allowing 200 barrels of oil to spill into the Gulf.
5. The high level sensor on a stock tank failed allowing 35 barrels of oil to overflow from the tank.

Table 53.

U.S. Geological Survey Warnings and Suspensions

WARNINGS

Period	Drilling	Workover	Production
12/72 - 3/73	17	1	358
12/72 - 9/73	34	2	1529
12/72 - 4/74	46	3	2649
12/72 - 9/74	48	9	3525
12/72 - 6/75	71	13	4931
12/72 - 1/76	74	17	5647
12/72 - 5/76	83	17	5856
12/72 - 12/76	106	17	6170
12/72 - 6/77	126	17	6513

SUSPENSIONS

Period	Drilling	Workover	Production
12/72 - 3/73	7	0	249
12/72 - 9/73	14	3	764
12/72 - 4/74	26	4	1437
12/72 - 9/74	34	6	2294
12/72 - 6/75	42	6	3298
12/72 - 1/76	50	6	4126
12/72 - 5/76	53	6	4445
12/72 - 12/76	57	6	5321
12/72 - 6/77	67	7	5879

Source: U.S. Geological Survey, 1977.

In accord with prescribed inspection procedures, Geological Survey personnel verified that remedial action had been taken in all reported spill incidents prior to the reactivation of the production facilities.

A program of intensive inspections is used on OCS leasing. Inspections are conducted on a regular basis with emphasis placed on operations. All production platforms are inspected every six months and each drilling well is inspected at least one time. The Geological Survey inspection force in the Gulf of Mexico has increased from seven technicians and five engineers as of July 1, 1969, to 39 technicians and 29 engineers as of June 30, 1977. During the period November 1, 1972 through June 30, 1977, technicians spent 22,667 inspection days or 199,146 man-hours, and engineers 1,907 inspection days or 16,584 man-hours in the field. Detailed inspections were conducted on 6,684 major producing platforms and 4,508 minor platforms in the Gulf of Mexico from December 1, 1972 through June 30, 1977. Also, during this time period, 3,615 inspections of single-wells or satellites were made by boat. Approximately 95 percent of these inspections were unannounced. Included in these inspections were 73,808 well completions. Also, during this time period, 8,526 inspections of drilling rigs were conducted. There is no absolute measure of the significance of these data per reporting period. However, it is apparent that inspections have increased considerably per period since 1972.

Minor incidents of non-compliance result in formal warnings while incidents on non-compliance of a potentially more hazardous nature result in well or platform shut-ins until the operation is in full compliance with regulations and orders.

Table 54 indicates equipment malfunctions detected during inspection and enforcement actions. These data include the results of some special inspections and all inspections within the last year, and are limited to the most frequent malfunctions detected. Listed in the third column are the number of items which did not operate within acceptable tolerances. These items did not fail or cause an undesirable event.

Velocity type subsurface safety valves are periodically pulled from the wells and checked. This requires removing the valve from the well for inspection, repair, adjustment and reinstallations. One company utilizes test stands to test the valve performance characteristics under simulated flow and pressure conditions. Surface operated subsurface safety valves are tested in place by releasing hydraulic pressure within the closed system thereby closing the valve; subsequently, the valve is reopened by repressuring the system. Automatic equipment is now in use which shuts down production whenever a leak occurs in pipeline or production facilities. These include, but are not limited to, pressure sensors and high and low level controls. Drip pans are placed under valves, vessels and the production system in order to prevent leaking oil from escaping into the waters of the Gulf.

From January 1973 to March 1977, the average number of pipeline malfunctions which resulted in oil spillage was approximately 19 per year (USDI, USGS, 1977).

Experienced private and government personnel are aware that public attention was focused on the oil spill at Santa Barbara in January 1969, and probably because of this awareness, there has been a great deal less oil pollution in the Gulf as a result of normal oil and gas producing operations. Table 55 summarizes the oil spills in the Gulf of Mexico from June, 1976 through June, 1977.

From January 1, 1971 through January 31, 1978, there were approximately 50,000 barrels of oil produced per each barrel of oil spilled.

In the past, major events were cataloged while less serious events were often not reported. Some years ago, wells were on occasion intentionally flowed into the water for short periods during clean-up operations. Now, sophisticated burning devices are designed to consume this well clean-up oil without producing air or water pollution.

5. Oil Spill Contingency Plans

Oil spills will occasionally occur as a result of natural disasters, equipment failure or human error. In the event that such an emergency occurs, the following action will be taken:

a. REGIONAL AND NATIONAL CONTINGENCY PLANS

If the operator should be unable to control and remove the pollution, the Regional or National Oil Hazardous Substances Pollution Contingency Plan may be activated and the designated Federal On-Scene Coordinator would direct control and clean-up operations at the operator's expense. This has never been necessary to date in the case of any spill from OCS operations.

Table 54

Equipment Malfunctions, January 1975 - May 1977

Item	Checked	Operable	Inoperable or not with Acceptable tolerances*	Failures or Malfunctions (%)
Surface safety valve. . .	20,825	20,232	593	2.8%
Flowline.	41,052	40,604	448	1.1%
Check valve	19,764	18,527	1,237	6.2%
Pressure vessels:				
High pressure sensor. .	16,976	16,550	426	2.5%
Low pressure sensor . .	13,941	13,702	239	1.7%
High level shut-in. . .	14,640	14,346	294	2.0%
Low level shut-in . . .	8,549	8,271	278	3.2%

Source: U.S. Geological Survey, 1977.

Notes: *Items which did not operate within an acceptable tolerance during inspection. These items did not fail.

Table 55

MAJOR OIL SPILL INCIDENTS - OCS

Calendar Year	Incidents	Oil Spilled (B)	Fixed Structures	Annual OCS Production (MMMB)
1964	5	14,928	1,100	123
1965	2	2,188	1,200	145
1966	0	None	1,325	189
1967	1	160,639	1,450	222
1968	1	6,000	1,575	269
1969	6	30,024	1,675	313
1970	3	83,895	1,800	361
1971	1	450	1,891	419
1972	0	None	1,935	412
1973	4	22,175	2,001	395
1974	2	22,046	2,054	361
1975	1	Unknown	2,079	330
1976	2	4,300	2,096	317
1977	2	500	2,248	307
Total	30	347,145		4,163

Source: U.S. Geological Survey (1978)

Notes: (B) barrel
(MMMB) one million barrels

The Regional or National Oil and Hazardous Substances Pollution Contingency Plan was developed pursuant to the provisions of the Federal Water Pollution Control Act as amended (33 U.S.C. 1251 et seq.). The Council on Environmental Quality has published the revised National Oil and Hazardous Substance Contingency Plan as required by the Federal Water Pollution Control Act Amendments of 1972. Section 311(c)(2) of that statute authorized the President, within sixty days after the sections became effective, to prepare and publish such a Plan. The Plan provided for efficient, coordinated and effective action to minimize damage from oil (and other) discharges, including containment, dispersal and removal. The Plan includes: assignment of duties and responsibilities; identification, procurement, maintenance and storage of equipment and supplies; establishment of a strike force and emergency task force; a system of surveillance and notice; establishment of a national center to coordinate response operations; procedures and techniques to be employed in identifying, containing, dispersing and removing oil; and a schedule identifying dispersants and other chemicals that may be used in carrying out the Plan and the waters and quantities in which they may be safely used. Annex X of the Plan sets forth stringent requirements on the use of chemical and biological agents in controlling spills. These agents can be used for safety reasons (to prevent fire or explosions) or for certain other circumstances such as the protection of endangered waterfowl. However, the approval of EPA is required, except in cases of safety when the approval of the On-Scene Coordinator is required. The Plan is revised from time to time as necessary. Operation of the National Contingency Plan requires a nationwide network of regional contingency plans. Guidelines for that nationwide network are established in the National Plan. This Plan provides for a pattern of coordinated and integrated responses of departments and agencies of the Federal Government to pollution spills. It establishes a nationwide response team and provides guidelines for the establishment of regional contingency plans and the response teams. The Plan also promotes the coordination and direction of Federal, State and local response systems and encourages the development of local government and private capabilities to handle such pollution spills.

The objectives of the Plan are: to develop appropriate preventive and preparedness measures for discovering and reporting the existence of a pollution spill; to promptly institute measures to restrict further spread of the pollutant; to assure that the public health, welfare and natural resources are provided adequate protection; to provide for the application of techniques for clean-up and disposal of the collected pollutants; to provide strike forces of trained personnel and adequate equipment to polluting spills, to institute actions to recover clean-up cost; and to effect enforcement of existing Federal statutes and regulations issued thereunder. Detailed guidance is contained in the basic Plan, the annexed and the regional plans.

The Plan is effective for all U.S. navigable waters including inland rivers, the Great Lakes, coastal territorial waters and the contiguous zone and high seas beyond this zone where a threat exists to U.S. waters, shore-face or shelf-bottom. Its provisions are applicable to all Federal agencies.

A memorandum of understanding between the Department of the Interior and the Department of Transportation outlines the respective responsibilities of the Geological Survey and the Coast Guard under the National Contingency Plan. The Geological Survey is responsible for the coordination and direction of measures to abate the source of pollution when the source is an oil, gas or sulphur well. This responsibility includes the authority to determine whether pollution control operations within a 500 m radius of the pollution source should be suspended to facilitate measures to abate the source of pollution. The Coast Guard is responsible for the coordination and direction of measures to contain and remove pollutants, and shall furnish or provide the On-Scene Coordinator with authority and responsibilities as provided by the National Contingency Plan. The Gulf of Mexico Strike Force Team in Bay St. Louis, Miss. may also respond to any pollution emergency.

b. PETROLEUM INDUSTRY CONTINGENCY PLAN

Inventory of known resources available for emergency oil spill control and clean-up

From the upper Texas coast to the Mississippi Delta region offshore operators maintain a large inventory of various kinds of equipment that could be put to use on short notice for containing and cleaning up an oil spill and stopping the source of the spill. This inventory includes 177 boats ranging from 30 crewboats to 50 m utility and cargo vessels, 64 helicopters, and 103 fixed-wing aircraft.

As of August 1, 1978, there were 58 companies that belonged to Clean Gulf Associates for offshore Louisiana. Their purpose is to provide for a stockpile of oil spill containment and clean-up materials for use by member companies in offshore and estuarine areas. Clean Gulf Associates has contracted, effective August 1, 1972, with Halliburton Services to maintain equipment, materials necessary to contain and clean-up spills in the Gulf of Mexico to the limits of the OCS lying offshore and seaward of the states of Texas, Louisiana, Mississippi, Alabama and Florida. Halliburton will assist member companies in the clean-up.

All of the tracts considered in this proposal fall within this area. Before any drilling commences, should this proposed sale be held, an inventory of pollution combatting equipment would be stockpiled at a strategic location. Spill booms, skimmers, vacuums, sprayers and absorbents are examples of equipment stockpiled.

As of January 1, 1978, cleanup, equipment was located at the following locations: Venice, Cameron, Houma, Intercoastal City, Galveston, Rockport, and Grand Isle.

These systems include: fast response open sea/bay, high volume open sea, and shallow water skimmer systems and auxiliary shallow water and beach clean-up equipment.

c. EFFECTIVENESS OF CLEAN-UP OPERATIONS

The effectiveness of offshore clean-up is contingent upon weather. The equipment which is now stockpiled and available as well as that which will be built in the near future, is not completely effective in high winds or waves. The more accessible and consolidated the pollutants the more effective the containment and removal equipment. The average recovery of oil spilled at sea is on the order of 20 percent (Biglane, 1975).

A major problem of spill clean-up operations involves the disposal of oil contaminated debris. If a spill involves a large quantity of such debris, an acceptable disposal site must be found. The residents of shore communities are becoming increasingly reluctant to commit their disposal sites, which are of limited capacity, to this use. If the debris is not disposed of properly, secondary contamination of surface or ground waters can result.

d. OFFSHORE OIL POLLUTION COMPENSATION FUND

The Outer Continental Shelf Lands Act, as amended, established this Fund to provide procedures to be followed in the event of an oil spill and compensation for cleanup costs and damages resulting from such a spill. It establishes a Fund in the Treasury in an amount not to exceed $200 million. The Fund is administered by the Secretaries of Transportation and Treasury. A fee not to exceed 3 cents per barrel of oil obtained from the OCS is assessed the owner of the oil when it is produced. Claims may be made for economic loss (removal costs and damages) arising from or directly resulting from oil pollution. This applies to spills from any offshore facility in the OCS and any vessel operating in offshore waters carrying oil directly from an offshore facility. The owner or operator of a vessel or of an offshore facility is jointly, severally, and strictly liable for all loss under a claim. Except willful misconduct or gross negligence, total liability is limited to $250,000 or $300 per gross ton for a vessel and $35 million plus removal and cleanup costs for an offshore facility. Owners or operators of vessels must maintain evidence of their financial responsibility.

B. Structures

If a ship strays from established safety fairways, oil and gas platforms can pose a hazard to commercial shipping. This hazard however, is minimized by the fact that safety fairways are clearly designated on navigation charts. Directional drilling from outside safety lanes is used to develop tracts lying partially under safety lanes. Pertinent portions of the Federal Regulations (33 CFR Sec. 209.135(b), 1971) governing shipping fairways and anchorage areas are as follows:

> "The Department of the Army will grant no permits for the erection of structures in the area designated as fairways, since structures located therein would constitute obstructions to navigation. The Department of the Army will grant permits for the erection of structures within an area designated as an anchorage area, but the number of structures will be limited by spacing as follows: The center of a structure to be erected shall be not less than two (2) nautical miles from the center of any existing structures. In a drilling or production complex, associated structures shall be as close together as practicable having the consideration for the safety factors involved. A complex of associated structures, when connected by walkways, shall be considered one structure for the purposes of spacing. A vessel fixed in place by moorings and used in conjunction with the as-

> sociated structures of a drilling or production complex, shall be considered as attendant vessel and its extent shall include its moorings. When a drilling or production complex includes an attendant vessel and the complex extends more than five hundred (500) yards from the center of the complex, a structure to be erected shall not be closer than two (2) nautical miles from the near outer limit of the complex. An underwater completion installation in an anchorage area shall be considered a structure and shall be marked with lighted buoy as approved by the United States Coast Guard.''

Development of those tracts in the proposed sale which lie partially within shipping fairways or anchorage areas will be subject, if leased, to Federal regulations as presented above so far as the placement of structures is concerned. This would help mitigate any potential impact due to the proximity of structures to relatively high frequency sea traffic (Visual No. 1).

Commercial vessels are required to report to the Coast Guard whenever a casualty results in any of the following: actual physical damage to property in excess of $1,500, material damage effecting the sea-worthiness or efficiency of a vessel, stranding or grounding, loss of life or injury causing any person to remain incapacitated for a period in excess of 72 hours except injury to harbor workers not resulting in death and not resulting from vessel casualty or vessel equipment casualty. Drilling and production platforms (artificial islands) are required to report to the Coast Guard when involved in a casualty or accident and if any of the following occur: if hit by a vessel and damage to property exceed $1,500, damage to fixed structure exceeds $25,000, material damage affecting usefulness of lifesaving or fire fighting equipment or loss of life.

Under some conditions, offshore structures are an obstacle to commercial fishing activities. An offshore structure can remove areas of trawling and purse seining waters; heavy concentrations of platforms can make trawling and purse seining operations difficult.

The erection of more structures on the OCS may affect commercial fishing operations. The impact from platforms may be kept to a minimum by allowing only those structures necessary for proper development and production of the mineral resources, and by placing them with due regard to fishing operations and other competing uses which are evident at the time of platform approval.

C. Pipelines

1. Existing Responsibilities

Section 5(e) of the OCS Lands Act (43 U.S.C. 1334), as amended, provides rights-of-way authorization for pipelines through the OCS lands may be granted by the Secretary to transport oil, natural gas, sulphur or other minerals.

In regard to these existing OCS-related oil responsibilities, the DOE Organization Act specifically transferred to FERC ''all functions and authority of the Interstate Commerce Commission or any officer or component of such Commission where the regulatory function establishes rates or charges for the transortation of oil by pipeline or establishes the valuation of any such pipeline.''

Oil and gas pipelines must transport or purchase without discrimination production from the OCS in the vicinity of the pipeline under conditions determined by the Federal Energy Regulatory Commission (FERC). Every permit, license, rights-of-way or easement must require non-discriminatory access to owner and nonowner shippers. They must also require that FERC may order an expansion in throughout capacity of the pipeline upon request in areas other than the Gulf of Mexico and the Santa Barbara Channel.

Federal responsibility and authority for gas and oil pipeline routing or operation on submerged coastal lands is vested in a number of agencies, including the following: (a) Department of the Interior, Bureau of Land Management—rights-of-way for common carrier pipelines on the OCS, (b) Geological Survey—jurisdiction over producer owned gathering lines and flow-lines on the OCS, and (c) U.S. Fish and Wildlife Service—protection of fish and wild-life resources and their habitat through consultation with the Corps of Engineers in the process of issuing Federal permits in navigable waters. U.S. Army Corps of Engineers—issues permits for construction (including pipelines) on OCS and in other navigable waters; Federal Energy Regulation Commission—grants ''certificates of convenience and necessity'' prior to construction of interstate natural gas pipelines and grants approval of the tariff rates for transportation of oil by common-carrier pipelines; Department of Transportation, Office of Pipeline Safety—establishes minimum standards for pipeline construction, operation and maintenance; and Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service—protection of marine fishery resources and their habitat (in coordination with the U.S. Fish and Wildlife Service) through consultation with the Corps of Engineers in the process of issuing Federal permits in navigable waters.

At present, the cooperative effort between the Department of the Interior and the Corps of Engineers, and the National Marine Fisheries Service and State conservation agencies is responsible for minimizing the impact of pipeline and other construction in navigable waters and adjacent and contiguous wetlands of the U.S.

In addition, an "Intergovernmental Planning Program for the Leasing and Transportation of OCS Oil and Gas", which is being implemented, will assure timely notification of proposed pipeline routes (and, therefore, landfalls) and other related OCS oil and gas activities by directly involving state and local government in the planning and decision-making process.

The program will establish in each leasing area Regional Working Groups composed of representatives from the States within the region, BLM, Fish and Wildlife Service, U.S. Coast Guard, U.S. Geological Survey, the Environmental Protection Agency, National Oceanic and Atmospheric Administration, industry and representatives of special and private interests. These working groups will be under BLM/State co-chairmanship. The working groups will also include, on an ad hoc basis, representatives of other relevant Federal agencies, and special and private interest groups. The Regional Working Groups will be utilized initially to expedite and institutionalize existing preleasing activities between the States and Federal agencies. The tasks of the working groups will be to identify information needs, and to design studies and develop Transportation Management Plans in anticipation of decision points in the OCS leasing and development program. These plans will be subject to the approval of appropriate BLM and State decision-makers. The program goals are:

1. To facilitate orderly and timely development of hydrocarbon resources on the OCS to meet the Nation's energy needs.
2. To protect environmental resources on the OCS and coastal areas.
3. To establish a process for early and continued cooperative planning to meet the management information needs of the affected decisionmaking bodies in each OCS region.

To accomplish the above goals, management studies plans and transportation management plans for each OCS leasing region will be developed to provide for maximum compatibility of production, transport, storage, and processing of oil and gas from the OCS with other economic and environmental resources offshore and in the coastal zone. The program in each region will be completed in four distinct phases: (I) Prelease sale coordination which includes current BLM leasing activities and identification of potential regional transportation corridors and issues; (II) Regional Management Studies Plan and implementation; (III) Site-Specific Management Studies Plan and implementation; and (IV) Regional Transportation Management Plan. The initiation of Phases III and IV will be contingent upon the discovery of marketable reserves within the region. Each phase will build upon the information provided by the preceding phase(s).

The scope of this planning effort will include both pipelines and surface transportation in developing a regional transportation management plan. In the case of pipelines, the planning process will include the transport system from production area offshore to the first terminal facility onshore. Processing facilities beyond that point exceed the scope of this planning effort but are among factors to be considered by the States in defining possible landfalls. If surface transportation is determined to be the appropriate mode, the program will include the system from production area to storage facility offshore and to the port, or transshipment point within the region. If the production is to be moved outside the region, the affected port-refinery State(s) would be notified. The program is designed to address the needs of frontier areas and may be modified to meet future needs of regions having an existing oil and gas production, transportation, or processing infrastructure such as the States of Texas and Louisiana.

The following will constitute the major elements of a Regional Transportation Management Plan: (1) Analysis and recommendation for corridors and alternatives for environmentally sound pipeline management; (2) Identification of alternative areas for the location of onshore facilities; (3) Identification of feasible and optimal transportation modes and mixes; (4) Identification of appropriate use restrictions and mitigating measures for use by BLM, States, and other regulatory agencies; and (5) A plan for monitoring of construction and operations and any follow-up studies which may be required.

The management planning process will involve close cooperation and consultation of Federal and State governments, petroleum industry planners, and other special and private interests. Transportation routes will cross federally administered lands and may cross State administered lands, ultimately leading to facilities sited on locally regulated lands. Siting of facilities and transportation routes will depend heavily on the nature and requirements of the Coastal Zone Management Program and other land-use related programs of the States in which shoreside facilities will be located. It will also depend on local planning and zoning of coastal lands. Impact assessment will require the full participation of all parties in study design, conduct and funding in order to realistically meet national, regional, State and local needs. The strategy of the leasing and transportation planning program is the creation of a formal institutional structure. This structure would provide a forum for technical level planning by representatives of affected decisionmaking bodies in each of the OCS leasing regions.

An appropriate number of regional subgroups called State Working Groups will also be established on a similar organizational format. State Working Groups will be activated in those States with the highest probability of being affected by a given transportation alternative. The number of State Working Groups is flexible because these regional subgroups will be activated only after a marketable discovery of oil and/or gas in a region and will involve only the specifically affected State(s). For the purpose of this program, affected States are those in which potential pipeline terminals or surface transportation terminals in the region have been identified.

The input of other affected Federal agencies will be coordinated by the Regional and State Working Groups. Through this coordination process, information, data and advice can be exchanged. When the need arises, one or more of such agency representatives can be invited to participate in State or Regional Working Groups on an ad hoc basis.

2. Mitigating Measures

Federal, State and local authorities and private landowners may take measures to require that pipelines be buried; that canals in wetland areas be backfilled where possible; that bulkheads be erected and maintained in marsh areas to prevent saltwater intrusion; that specific types of dredging equipment be used and specific methods for placement or disposal of spoil be required; that beach and dune areas crossed by pipelines be restored; that pipeline installations in sensitive or vulnerable areas be seasonally timed so as to occur, for example, during low periods of tourist and recreational activities, or prohibited during acute periods of nesting of waterfowl or migrations of fish and wildlife.

The Department of the Interior will ultimately receive applications for the OCS component of pipelines resulting from this proposed sale, and after considering all factors, may approve pipeline routes. The procedure for this is outlined in a Memorandum of Understanding between the Bureau of Land Management and the Geological Survey for Outer Continental Shelf Pipelines. The purposes of the Memorandum is to clearly define the administrative and operational roles of the Bureau of Land Management and the U.S. Geological Survey relating to pipelines on the OCS, to provide consistent and standardized procedures, and to minimize or eliminate dual and overlapping functions. The objectives of the Memorandum are to:

> Provide an efficient mechanism for approving pipeline routes through the submerged lands of the OCS.
>
> Initiate measures to provide safety and to minimize or eliminate environmental damage which may be associated with the installation and operation of pipelines originating on the OCS.
>
> Be responsive to the interests of the oil and gas industry, other users of the OCS, and the public with respect to pipelines.
>
> Streamline implementation of the regulations and procedures for more efficient and uniform administration of the Department's authority with respect to pipelines.

The Bureau of Land Management's role in pipeline management on the OCS is:

> Conduct pipeline routing studies and, with the concurrence of the USGS, designate pipeline corridors on the OCS for all pipelines other than flow or gathering lines within the confines of a single lease or group of contiguous leases under unitized operation or a single operator.
>
> Maintain a central office of record for the locations of all existing and future pipelines and associated structures on the OCS.

Prepare environmental assessments, pipeline system planning studies, economic studies, and environmental impact statements when necessary or appropriate, prior to approving applications for rights-of-way pursuant to 43 U.S.C. 1334 and 43 CFR 2883.

Receive applications for rights-of-way for pipelines to be installed on the OCS pursuant to 43 U.S.C. 1334(c) and 43 CFR 2883.

After considering the potential impact of the pipelines on the environment, the relationship of the application to existing pipeline routes on the OCS, and other factors approve or disapprove the application pursuant to 43 CFR 2883.

Existing regulations under which BLM regulates pipelines (43 CFR 2883) are currently being revised in response to Section 5(e) and (f) of the Outer Continental Lands Act Amendments of 1978 (44 Fed. Reg. 6471, February 1, 1979). In conjunction with these changes, the regulations have been renumbered 43 CFR 3340. New provisions in the proposed regulations allow stipulations and conditions to be attached, as a condition of approval, to protect human, marine, and costal environments, and life, including aquatic life, in the vicinity the right-of-way. These factors must also be considered in making a decision to approve or deny an application for a right-of-way. The right-of-way holder must agree to utilize the best available and safest technologies, including the best available technologies for pipeline burial, and must construct, operate and maintain the pipeline in a manner so as not to pose an unreasonable obstruction to fishing or shipping operations. A provision for suspension of operations threatening serious, irreparable, or immediate harm to life, property or the environment, has been added. Finally, the provision regarding abandonment, relinquishment, revocation or termination has been clarified, and a provision added to require domes over, or burial of possible obstructions when the right-of-way is thus ended.

The U.S. Geological Survey regulations (30 CFR 250.18) regarding pipeline permitting have also been modified (44 Fed. Reg. 13527, March 12 1279). No major changes in provisions are included.

The Geological Survey's role in pipeline management is:

Consider all applications from a lessee or operator for a right of use and easement to contruct and maintain pipelines and associated structures on the OCS pursuant to 30 CFR 250.18 and 250.19. Prior to granting approval of such applications for any pipeline other than flow or gathering lines within the confines of a single lease or group of contiguous leases under unitized operation or a single operator, consult with BLM so that the routing of such pipelines may be coordinated with existing lines or designated pipeline corridor.

Review technical aspects of OCS pipeline design, installation, maintenance and operation in accordance with appropriate regulations and standards designed for safety and environmental protection, and to avoid undue interference with other uses of the OCS and its superjacent waters.

Prepare environmental assessments or impact statements when necessary prior to approving applications filed pursuant to 30 CFR 250.18 and 250.19.

Provide BLM with the location, as installed, of all pipelines approved by the USGS as specified above.

This memorandum notwithstanding, some potential adverse effect related to OCS induced pipeline sitings occur nearshore and onshore and generally remain outside BLM authority to apply direct mitigatory measures. However, the ability to regulate pipelines on the OCS implies certain influence over the allocation of nearshore and onshore resources. This ability represents a management tool with the potential to indirectly mitigate many adverse effects of random pipeline placement in areas beyond BLM jurisdiction. The ability to structure one component of a total transportation system permits a greater degree of departmental management, control and environmental responsiveness of Federal, industry and State expressions of pipeline requirements and siting policy; offshore and onshore are integrated during pre-planning stages.

The Department plans to structure sale-related pipeline development for tracts leased in this proposed sale as per its responsibility for pipeline system planning on the OCS. Pipeline development activities are partly a function of environmental assessment (both offshore and onshore), operational and economic dictates, and the transportation needs of the impacted area. Recognition of these parameters in a coordinated federal, state, industry, and local government effort will result in pipeline sitings which recognize economic feasibility and zones of least environmental impact. Such an effort is anticipated before the granting of pipeline rights-of-way brought about by this sale.

D. Other Mitigating Measures

1. Notices to Lessees and Operators

These notices have the same effect or status as OCS Operating Orders and Regulations and are used when expeditious clarifications or corrections and additions to existing orders and regulations are necessary. By issuing Notices to Lessees and Operators, the extensive amount of time necessary to amend and republish orders and regulations is avoided. An example of a Notice to Lessees and Operators would be Notice No. 75-3, which details minimum geophysical survey requirements to protect cultural resources .

2. Departures

A departure (waiver) from OCS orders or other rules of the U.S. Geological Survey, may be granted by the Supervisor when such a departure is determined to be necessary for (30 CFR 250.12(b)): the proper control of a well, conservation of natural resources, protection of aquatic life, protection of human health and safety, protection of property or protection of the environment.

Waivers are technically based decisions and are granted only in situations in which expert judgment determines that better and safer operations would result from operations under the waiver.

3. Geophysical Information

The Conservation Division of the Geological Survey is aware of near-surface structural configurations and its effect on drilling, fixed-structural emplacement, pipelines, etc., in relation to the proposed lease tracts. Knowledge of near-surface structural conditions is fundamental to a sound lease management program for the OCS.

The Supervisor, Geological Survey, will prohibit the placement of platforms on areas of instability through his authority to issue or not issue permits for platform placement.

4. Conservation Practices

The GS Oil and Gas Supervisor utilizes well information such as electric well logs, core information from other wells previously drilled in the vicinity of the proposed drilling program, geological and geophysical data and other pertinent reservoir information in order to determine the proper number of wells which are necessary for development and proper conservation of the resource.

The Supervisor has wide authority and responsibility with regard to oil and gas operations on the OCS. Title 30 CFR 250.34 sets forth the Supervisor's responsibilities in approving Exploratory and Development Plans. *30 CFR 250.50* grants the Director of the USGS authority to demand pooling or unitization which the Secretary is authorized to require under the OCS Lands Act. *30 CFR 250.51* refers to the unit plan regulations contained in 30 CFR 226 with regard to obtaining approval of units or cooperative agreements. *30 CFR 250.52* lists purposes for which the Supervisor may approve pooling or drilling agreements.

5. Requirements of Other Federal Agencies

The operator must comply with applicable navigation and inspection laws and regulations administered by the U.S. Coast Guard. These relate to the safety of personnel and display of prescribed navigational lights and signals for the safety of navigation.

Certain regulatory and administrative efforts are conducted by the U.S. Coast Guard to implement various provisions of national laws and international conventions in order to decrease the amount of oil introduced into marine ecosystems through tanker operations. These include provisions of the Ports and Waterways Safety Act of 1972 (P.L. 92-500), and Annex I of the 1973 International Convention for the Prevention of Pollution from Ships. The port and Tanker Safety Act of 1978 (P.L. 95-474) amends the Ports and Waterways Safety Act of 1972 and, for the most part, incorporates the results of the 1978 Tanker Safety and Pollution Prevention Conference.

Permits to install islands and fixed structures and permits for the drilling of wells from mobile drilling vessels must also be obtained from the U.S. Army Corps of Engineers, which is authorized by the OCS Lands Act to prevent obstruction to navigation. The decision as to whether a permit will be issued by the Corps of Engineers is based on an evaluation of the impact of the proposed work on navigation and consideration of national security.

All drilling structures must be located outside of any navigation fairway established by the Secretary of the Army. Pipeline construction must also be in compliance with standards established by the Office of Pipeline Safety Operations in the Materials Transportation Bureau, Department of Transportation.

The Department of Labor establishes Occupational Safety and Health Standards which are applicable to OCS operations.

Operators must comply with the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500; 86 Stat. 816) which establishes a National Pollutant Discharge Elimination System 40 CFR Part 125, F.R. 13528 (1973). This system applies to discharge on the OCS from any point source and requires any person to obtain a permit from the EPA for the discharge of any pollutant as defined by the Act. Discharges of any pollutant without the necessary permit from EPA is made unlawful by the Act. Pursuant to section 501(b) of the Act, the Department of the Interior has suggested to EPA that the feasibility of a memorandum of understanding between the two agencies be considered in order to facilitate the administration of the NPDES as it applies to discharges arising from OCS lease operations and to minimize any redundancy of efforts by the Geological Survey and EPA. This feasibility study is currently under consideration. As noted in Section I.C.4., while EPA has not been issuing NPDES permits for oil and gas operations in the Gulf of Mexico, they may start doing so for operations near the Flower Garden Banks in the near future and may eventually do so for operations near other biologically sensitive areas as well. A draft of EPA's proposal includes:

1) No NPDES permits will be issued for drilling within 1 nmi of the 100 m isobaths around the 2 banks on blocks already leased at this time or within 6 nmi of the centers of the banks on blocks leased after this date.

2) No bulk discharges of drilling fluids will be permitted for any drilling facilities within 9 nmi of the bank centers.

3) All in-process discharges of drill cuttings and adhering fluids must be shunted to within 6 m of the bottom for discharge.

4) Drilling plans and actual drilling schedules will be required of the oil and gas companies to provide information to be correlated with an EPA approved monitoring program conducted during the drilling of each well.

5) A contingency plan must be prepared for spills of oil and hazardous materials. Further, there must be a contingency plan for operations, should EPA impose a permit condition prohibiting the discharge of any drilling fluids or cuttings.

6) Limitations are placed on drilling facility discharges of deck drainage, sanitary wastes and cooling water.

EPA proposes to attach these conditions to all NPDES Permits to be issued within the 9 nmi boundary of NOAA's proposed Flower Garden Bank Marine Sanctuary. To provide Federal consistency the Agency is recommending that NOAA adopt the permit conditions in its Marine Sanctuary Regulations. Several of these permit conditions are already being applied by USGS and others are simply extensions of currently applied lease stipulations (using the 100 m isobath rather than BLM's 85 n isobath for determining the area in which certain restrictions would apply). The Department of the Interior sees no need for these increased operational restrictions since it is well documented that current stipulations are effective in protecting the biota of the banks. It is not clear at this time (October 1978) when these permit conditions would be applied, when EPA will start issuing permits or what the final conditions will be. It is likely that more stringent operational restrictions will eventually be imposed by EPA.

The U.S. Geological Survey also establishes GS Safety Requirements pertaining to OCS operations:

Geological Survey Standard, Outer Continental Shelf No. 1 (GSS-OCS-1) defining the safety requirements for drilling operations in a hydrogen sulfide environment was published in the Federal Register, Vol. 41, No. 42, March 2, 1976. This standard will be referenced in the Hydrogen Sulfide Section of OCS Order No. 2.

6. Special Stipulations

Leases for oil and gas exploration and development are subject to all OCS operating orders and regulations. However, in some cases, leases offered in a particular OCS lease sale should include special stipulations for added protection of a particular resource or activity.

For this proposed sale, lease stipulations have been recommended to the Secretary of the Interior to provide for the protection of human, biological, and cultural resources while allowing the orderly development of oil and gas resources (figs. 34 and 35).

The following stipulations are proposed to be included in any lease issued, except as otherwise indicated:

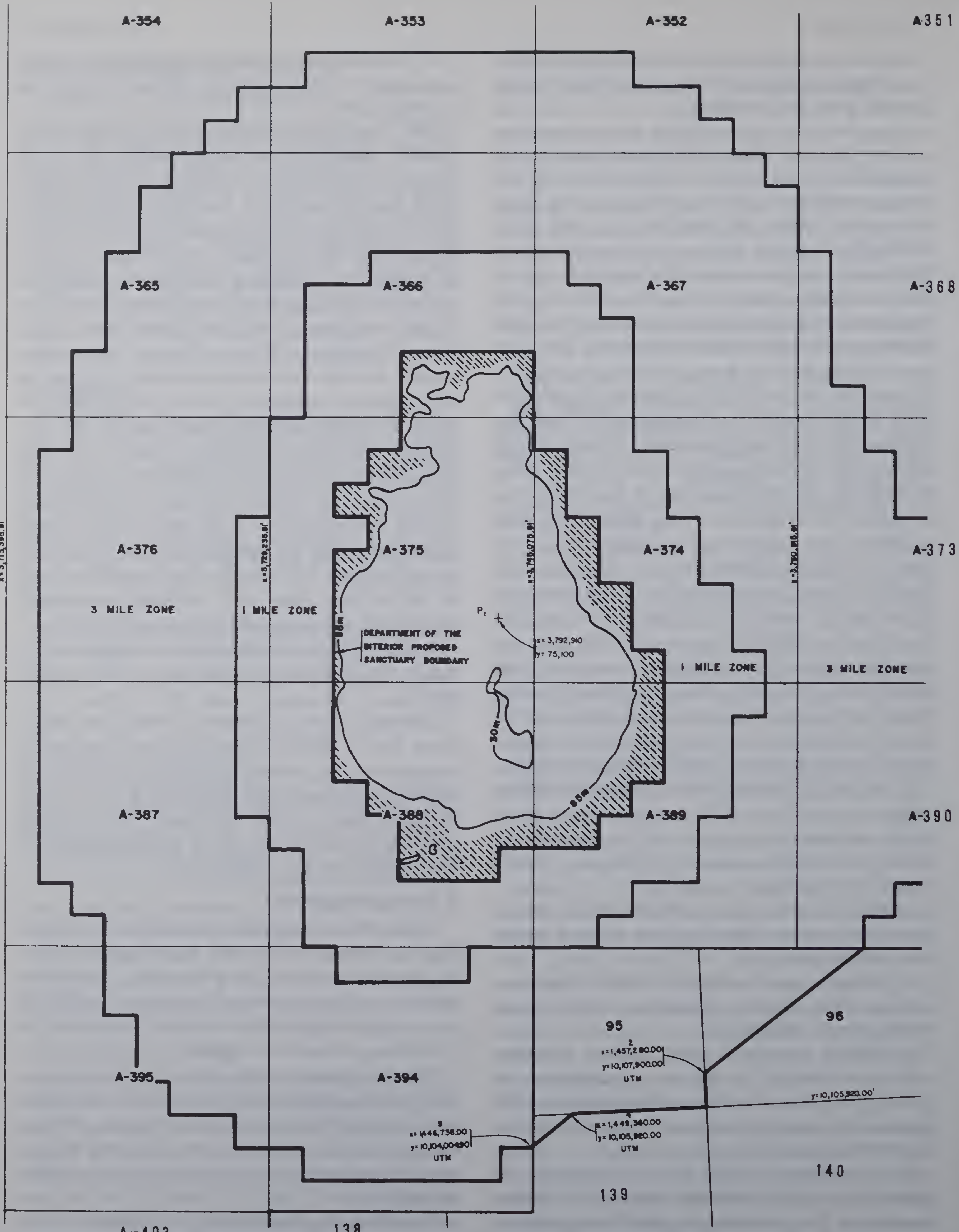


FIGURE 34
EAST FLOWER GARDENS BANK

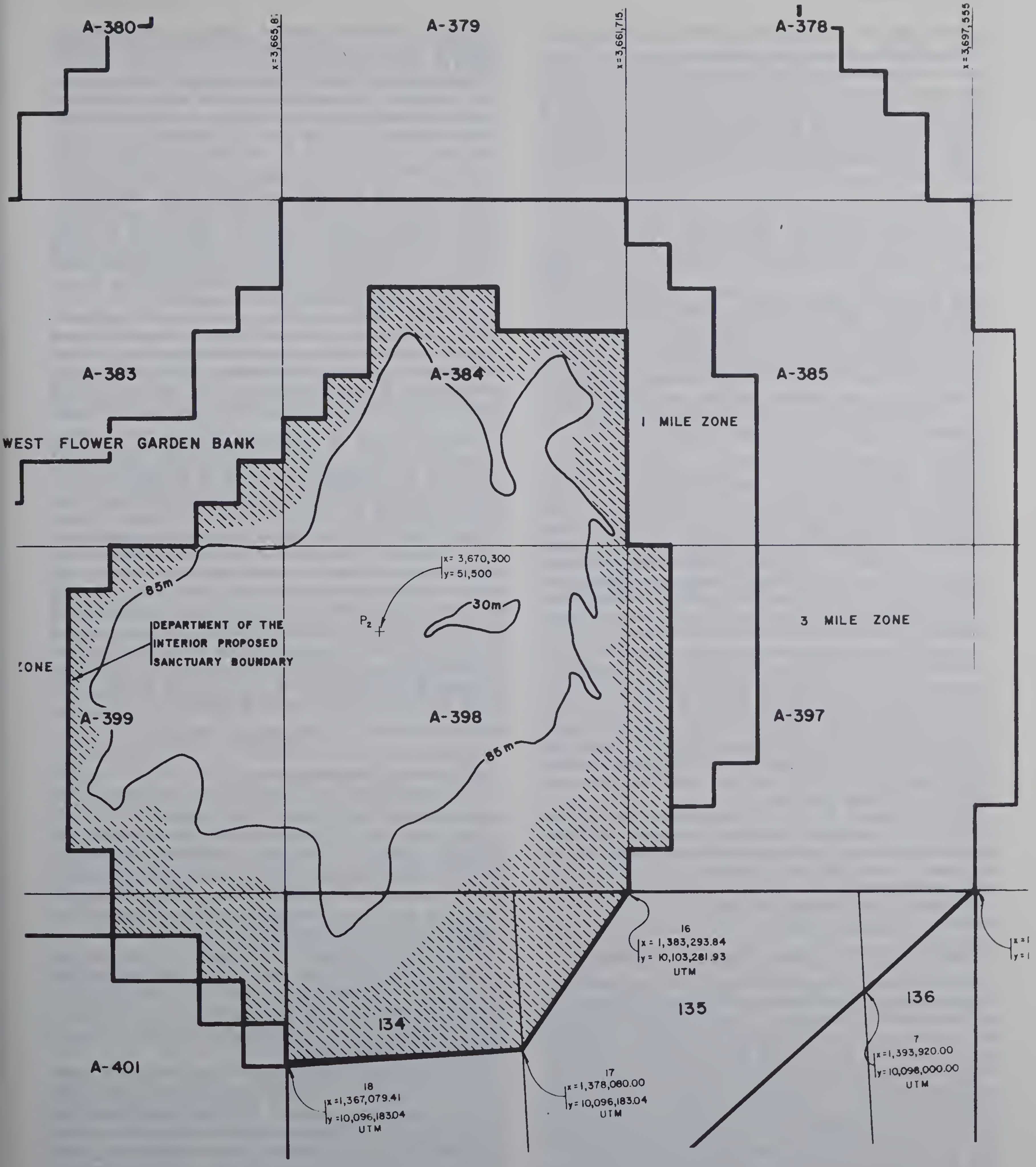


FIGURE 35

WEST FLOWER GARDEN BANK

Stipulation No. 1 (Cultural Resources Protection):

If the Supervisor, having reason to believe that a site, structure or object of historical or archaeological significance hereinafter referred to as "cultural resource", may exist in the least area, gives the lessee written notice that the lessor is invoking the provisions of this stipulation, the lessee shall upon receipt of such notice comply with the following requirements.

Prior to any drilling activity or the construction or placement of any structure for exploration or development on the lease, including but not limited to, well drilling and pipeline and platform placement, hereinafter in this stipulation referred to as "operation", the lessee shall conduct remote sensing surveys to determine the potential existence of any cultural resource that may be affected by such operations. All data produced by such remote sensing surveys as well as other pertinent natural and cultural environmental data shall be examined by a qualified marine survey archaeologist to determine if indications are present suggesting the existence of a cultural resource that may be adversely affected by any lease operation. A report of this survey and assessment prepared by the marine survey archaeologist shall be submitted by the lessee to the Supervisor and to the Manager, Bureau of Land Management (BLM) Outer Continental Shelf (OCS) office for review.

If such cultural resource indicators are present the lessee shall: (1) locate the site of such operation so as not to adversely affect the identified location; or (2) establish, to the satisfaction of the Supervisor, on the basis of further archaeological investigation conducted by a qualified marine survey archaeologist or underwater archaeologist using such survey equipment and techniques as deemed necessary by the Supervisor, either that such operation will not adversely affect the location identified or that the potential cultural resource suggested by the occurrence of the indicators does not exist.

A report of this investigation prepared by the marine survey archaeologist or underwater archaeologist shall be submitted to the Supervisor and the Manager, BLM OCS Office for their review. Should the Supervisor determine that the existence of a cultural resource which may be adversely affected by such operation is sufficiently established to warrant protection, the lessee shall take no action that may result in an adverse effect on such cultural resource until the Supervisor has given directions as to its preservation.

The lessee agrees that if any site, structure, or object of historical or archaeological significance should be discovered during the conduct of any operations on the leased area, he shall report immediately such findings to the Supervisor, and make every reasonable effort to preserve and protect the cultural resource from damage until the Supervisor has given directions as to its preservation.

Evaluation of the Cultural Resource Stipulation:

Should the archaeology survey be implemented prior to initiating oil and gas operations within the high probability cultural resource zone, (Visual No. 1), the likelihood that petroleum related activities would endanger an unknown or reported historic shipwreck or early man living site would be further reduced. The effectiveness of remote sensing surveys can vary depending on factors such as instrumentation, professional interpretation, technique, and physical conditions such as water depth and weather conditions. The provisions of the stipulation assure professional involvement in the interpretation of data collected. Should the stipulation be adopted, instructions as to instrumentation, navigation, line spacing, and report format requirements are specified in a Notice to Lessees and Operators. Appendix C includes the Notice currently utilized in the Gulf of Mexico. The Department of Interior is considering a proposed revision to this notice. When the proposed revision has been drafted, it will be published in the Federal Register and comments solicited. Should a new notice be adopted, all surveys performed after the date of adoption would be subject to the revisions.

Instrumentation utilized, record quality, vessel speed and line spacing can all affect the ability of the professional interpreter to identify and define signatures indicative of potential cultural resources. All areas so identified as potentially containing valuable historic or archaeological resources would be either avoided, protected, and/or identified and mitigated in accordance with prescribed regulations. The flexibility of offshore operations has allowed most operators to avoid culturally sensitive areas. A permanent record of all survey reports is maintained by the USGS and BLM; therefore, should further archaeological investigation be desired at some future date, the results of remote sensing cultural resource surveys prior to oil and gas operations can be recalled.

In summary, adoption of the cultural resource stipulation would minimize the probability that a valuable cultural resource would be adversely impacted by this lease proposal. Furthermore, adoption of this stipulation will increase the data base, adding to our knowledge of the potential cultural resource sensitivity of the Gulf of Mexico's Outer Continental Shelf.

A special study by Coastal Environments Inc., has established probability zones for the potential existence of shipwrecks and aboriginal sites in the northern Gulf of Mexico. The final report has established cultural sensitivity zones within the leasable areas of the Gulf of Mexico outer continental shelf. The cultural resource demarcation line depicted on visuals 1 and 4 is derived from the high probability zones identified in Coastal Environment's study and is currently utilized as a primary factor in determining which tracts if leased, will require site specific remote sensing surveys as are called for in Stipulation 1. Hence BLM intends to recommend to the Supervisor, USGS, that remote sensing surveys, as described in Appendix C, be required on the following tracts should they be leased in the proposed sale: 3, 4, 7-10, 13-16, 18, 24-33, 38-41, 44-49, 55-58, 63-85, 90-94, 96-100 and 102-105.

Stipulation No. 2 (Biological Resources Protection):

A. Tract 58A-20 (Stetson Bank):

Operations within the following aliquots shall be restricted as specified in either 1 or 2 below:

High Island Area, South Addition, Block A-514: W½ E½NE¼; W½NE¼; N½SW¼; SW¼SW¼; NW¼SE¼.

1. All drill cuttings and drilling fluids must be disposed of by shunting the material to the bottom through a downpipe that terminates an appropriate distance, but no more than ten meters, from the bottom.

2. The operator (lessee) shall submit a monitoring plan as part of the exploration and development and production plans. The monitoring plan will be designed to assess the effects of oil and gas exploration, development, and production operations on the biotic communities of the nearby banks.

The monitoring program shall indicate that the monitoring investigations will be conducted by qualified independent scientific personnel and that these personnel and all required equipment will be available at the time of operations. The monitoring team will submit its findings to the Supervisor, on a schedule established by the Supervisor, or immediately in case of imminent danger to the biota of the bank resulting directly from drilling or other operations. If it is decided that surface disposal of drilling fluids or cuttings presents no danger to the bank, no further monitoring of that particular well or platform will be required. If, however, the monitoring program indicates that the biota of the bank is being harmed, or if there is a great likelihood that operation of that particular well or platform may cause harm to the biota of the bank, the Supervisor shall require shunting as specified in 1 above or other appropriate operational restrictions.

B. Tract 58A-37 (Bright Bank):

Operations within the circle with a radius of 8110 meters around point A, located by X=1,366,160; Y= -276,160 (Louisiana Lambert System), shall be restricted as specified in either 1 or 2 below.

1. All drill cuttings and drilling fluids must be disposed of by shunting the material to the bottom through a downpipe that terminates an appropriate distance, but no more than ten meters, from the bottom.

2. The operator (lessee) shall submit a monitoring plan as part of the exploration and development and production plans. The monitoring plan will be designed to assess the effects of oil and gas exploration, development, and production operations on the biotic communities of the nearby banks.

The monitoring program shall indicate that the monitoring investigations will be conducted by qualified independent scientific personnel and that these personnel and all required equipment will be available at the time of operations. The monitoring team will submit its findings to the Supervisor, on a schedule established by the Supervisor, or immediately in case of imminent danger to the biota of the bank resulting directly from drilling or other operations. If it is decided that surface disposal of drilling fluids or cuttings presents no danger to the bank, no further monitoring of that particular well or platform will be required. If, however, the monitoring program indicates that the biota of the bank are being harmed, or if there is a great likelihood that operation of that particular well or platform may cause harm to the biota of the bank, the Supervisor shall require shunting as specified in 1 above or other appropriate operational restrictions.

C. Tract 58A-89 (An Unnamed Bank):

Operations within the circle with a radius of 6400 meters around point B, located by X=2,205,050; Y= -209,485 (Louisiana Lambert System), shall be restricted as specified in either 1 or 2 below:

1. All drill cuttings and drilling fluids must be disposed of by shunting the material to the bottom through a downpipe that terminates an appropriate distance, but no more than ten meters, from the bottom.

2. The operator (lessee) shall submit a monitoring plan as part of the exploration and development and production plans. The monitoring plan will be designed to assess the effects of oil and gas exploration, development, and production operations on the biotic communities of the nearby banks.

The monitoring program shall indicate that the monitoring investigations will be conducted by qualified independent scientific personnel and that these personnel and all required equipment will be available at the time of operations. The monitoring team will submit its findings to the Supervisor, on a schedule established by the Supervisor, or immediately in case of imminent danger to the biota of the bank resulting directly from drilling or other operations. If it is decided that surface disposal of drilling fluids or cuttings presents no danger to the bank, no further monitoring of that particular well or platform will be required. If, however, the monitoring program indicates that the biota of the bank are being harmed, or if there is a great likelihood that operation of that particular well or platform may cause harm to the biota of the bank, the Supervisor shall require shunting as specified in 1 above or other appropriate operational restrictions.

D. Tract 58A-115 (East Flower Garden Bank) (fig. IV-1):

1. No structures, drilling rigs, or pipelines will be allowed within the aliquots established for the East Flower Garden Bank as follows:

High Island Area, East Addition, South Extension, Block A-374: SW¼NW¼NW¼; NW¼SW¼NW¼; S½SW¼NW¼; SW¼NE¼SW¼; W½SW¼; W½SE¼SW¼; SE¼SE¼SW¼

2. Exploration, development, and production operations are permitted within the aliquots described below with the following restrictions:

All drill cuttings and drilling fluids must be disposed of by shunting the material to the bottom through a downpipe that terminates an appropriate distance, but no more than 10 meters, from the bottom; however, if the shunting method is not adequate, as determined by the monitoring program proceedings outlined in this stipulation, to protect the unique character of the subject area, then the material must be transported a minimum of ten miles from any 50-meter isobath surrounding live reef-building coral before disposal. Disposal sites must be approved by the Supervisor.

No garbage, untreated sewage, or other solid waste shall be disposed of from vessels (workboats, crew-boats, supply boats, pipelaying vessels) during exploration and development operations.

The use of halogenated phenol bactericides in any phase of exploration, development, and production is prohibited.

No drilling permits shall be issued by the Supervisor until he has found that the lessee's exploration and development plan filed under 30 CFR 250.34 is adequate to insure that exploration, development and production operations in the leased area will have no significant adverse affect on the biotic communities associated with the high value reef sites on the Flower Garden Banks. As a part of the exploration plan and the development and production plan, a reef monitoring program must be included.

The monitoring program will be designed to assess the effects of oil and gas exploration, development, and production operations on the viability of the coral reefs and associated communities. The monitoring plan shall indicate that the monitoring investigations will be conducted by qualified independent scientific personnel and that program personnel and equipment will be available at the time of operations. The monitoring team will submit its findings to the Supervisor on a regular schedule established by the Supervisor, or immediately in case of imminent danger to the biota of the bank resulting directly from drilling or other operations.

The affected aliquots are as follows:

High Island Area, East Addition, South Extension, Block A-374: SW¼SW¼NE¼; W½NE¼NW¼; SE¼NE¼NW¼; N½NW¼NW¼; SE¼NW¼NW¼; NE¼SW¼NW¼; SE¼NW¼; N½NE¼SW¼; SE¼NE¼SW¼; NE¼SE¼SW¼; W½NW¼SE¼; SE¼NW¼SE¼; SW¼SE¼; SW¼SE¼SE¼

3. Exploration, development, and production operations are permitted within the aliquots described below with the following restrictions:

All drill cuttings and drilling fluids must be disposed of by shunting the material to the bottom through a downpipe that terminates an appropriate distance, but no more than 10 meters, from the bottom.

No garbage, untreated sewage, or other solid waste shall be disposed of from vessels (workboats, crew-boats, supply boats, pipelaying vessels) during exploration, development, and production operations.

The use of halogenated phenol bactericides in any phase of exploration, development, and production is prohibited.

No drilling permits shall be issued by the Supervisor until he has found that the lessee's exploration plan and development and production plan filed under 30 CFR 250.34 are adequate to insure that exploration, development, and production operations in the leased area will have no significant adverse affect on the biotic communities associated with the high value reef sites on the Flower Garden Banks.

The affected aliquots are as follows:

High Island Area, East Addition, South Extension, Block A-374: N½NE¼; N½S½NE¼; SE¼SW¼NE¼; S½SE¼NE¼; NE¼NE¼NW¼; NE¼SE¼; NE¼NW¼SE¼; N½SE¼SE¼; SE¼SE¼SE¼

E. Tract 58A-118 (West Flower Garden Bank) (fig. 35):

1. Exploration and development operations are permitted within the aliquots described below with the following restrictions:

All drill cuttings and drillings fluids must be disposed of by shunting the material to the bottom through a downpipe that terminates an appropriate distance, but no more than 10 meters, from the bottom.

No garbage, untreated sewage, or other solid waste shall be disposed of from vessels (workboats, crew-boats, supply boats, pipelaying vessels) during exploration and development operations.

The use of halogenated phenol bactericides in any phase of exploration and development is prohibited.

No drilling permits shall be issued by the Supervisor until he has found that the lessee's exploration and development plan filed under 30 CFR 250.34 is adequate to insure that exploration and production operations in the leased area will have no significant adverse affect on the biotic communities associated with the high value reef sites on the Flower Garden Banks. As a part of the development plan, a reef monitoring program must be included.

The monitoring program will be designed to assess the effects of oil and gas exploration and development operations on the viability of the coral reefs and associated communities. The monitoring plan shall indicate that the monitoring investigations will be conducted by qualified independent scientific personnel and that program personnel and equipment will be available at the time of operations. The monitoring team will submit its findings to the Supervisor on a regular schedule established by the Supervisor, or immediately in case of imminent danger to the biota of the bank resulting directly from drilling or other operations.

The affected aliquots are as follows:

High Island Area, East Addition, South Extension, Block A-385: SW¼NW¼NW¼; SW¼NW¼; W½SW¼; W½E½SW¼

2. Exploration an development operations are permitted within the aliquots described below with the following restrictions:

All drill cuttings and drilling fluids must be disposed of by shunting the material to the bottom through a downpipe that terminates an appropriate distance, but not more than 10 meters, from the bottom.

No garbage, untreated sewage, or other solid waste shall be disposed of from vessels (workboats, crew-boats, supply boats, pipelaying vessels) during exploration and development operations.

The use of halogenated phenol bactericides in any phase of explorations and development is prohibited.

No drilling permits shall be issued by the Supervisor until he has found that the lessee's exploration and development plan filed under 30 CFR 250.34 is adequate to insure that exploration and production operations in the leased area will have no significant adverse effect on the biotic communities associated with the high value reef sites on the Flower Garden Banks.

The affected aliquots are as follows:

High Island Area, East Addition, south Extension, Block A-385: E½; E½E½W½; W½E½NW¼; E½NW¼NW¼; NW¼NW¼NW¼

Evaluation of the Biological Resource Stipulation:

The Department of the Interior has been taking measures to protect the biota of biologically sensitive topographic high features ever since the importance of clear water banks near the shelf break was first recognized by BLM funded studies several years ago (and which are continuing). At the present time the method of achieving such protection consists of: (1) prohibiting any oil and gas activity whatsoever within the 85 meter (m) isobath of the feature; (2) requiring the shunting of all drill cuttings and drillings fluids to within 10 m of the bottom for drilling activities within one nautical mile of the 85 m isobath (monitoring of the effects of drilling activities on the biota of the bank also required at the East and West Flower Garden Banks); and (3) requiring either shunting as described above or the monitoring of the effects of drilling activities on the biota of the bank for drilling activities from one to three nautical miles of the 85 m isobath (at the Flower Gardens, shunting is required in this area).

Stipulation 2 would accomplish this for the four features in question.

These measures have been developed over the past few years by BLM in close consultation with USGS, USFWS, and recognized expert reef ecologists; and numerous studies, both those required by lease stipulations and those funded by BLM, at a number of banks including the Flower Gardens have failed to detect any adverse impact to the biota of such banks from oil and gas industry activities when measures such as those of Stipulation 2 are imposed.

Stipulation No. 3 (Halogenated Phenol Prohibition):

(To be included in all leases resulting from this proposed sale.) The utilization of halogenated phenol bactericides as a drilling fluid additive or for any use which would result in the disposal of this class of chemicals into the marine environment, as a result of operations pursuant to this lease, is prohibited.

Evaluation of the Halogenated Phenol Prohibition Stipulation:

Halogenate phenol bactericides are sometimes used as a drilling fluid additive and are subsequently introduced into the marine environment. Halogenated phenols are known to be highly toxic and persistent environmental contaminants. Alternative bactericides which are known to cause far less environmental damage are available for utilization by the petroleum industry. Therefore, the prohibition of the use of this class of chemicals has been determined to be necessary to avoid potential environmental degradation.

Stipulation No. 4 (Department of Defense Restrictions):

(To apply only to the leases resulting from this proposed sale for tracts 58A-1 through 58A-6 and 58A-8 through 58A-10.)

Whether or not compensation for such damage or injury might be due under a theory of strict or absolute liability or otherwise, the lessee assumes all risks of damage or injury to persons or property, which occur in, or above the Outer Continental Shelf, to any persons or to any property of any person or persons who are agents, employees or invitees of the lessee, its agents, independent contractors or subcontractors doing business with the lessee in connection with any activities being performed by the lessee in, on, or above the Outer Continental Shelf, if such injury or damage to such person or property occurs by reason of the activities of any agency of the U.S. Government, its contractors or subcontractors, or any of their officers, agents or employees, being conducted as a part of or in connection with the programs and activities of the Naval Air Training Command, Naval Air Station, Corpus Christi, Texas. The lessee assumes this risk whether such injury or damage is caused in whole or in part by any act or omission, regardless of negligence or fault, of the United States, its contractors or subcontractors, or any of their officers, agents, of employees. The lessee further agrees to indemnify and save harmless the United States against and to defend at its own expense the United States against all claims for loss, damage, or injury sustained by the lessee, and to indemnify and save harmless the United States against, and to defend at its own expense the United States against all claims for loss, damage, or injury sustained by the agents, employees, or invitees of the lessee, its agents, or any independent contractors or subcontractors doing business with the lessee in connection with the programs and activities of the aforementioned military installations, whether the same be caused in whole or in part by the negligence or fault of the United States, its contractors, or subcontractors, or any of their officers, agents, or employees and whether such claims might be sustained under theories of strict or absolute liability or otherwise.

The lessee agrees to control his own electromagnetic emissions and those of his agents, employees, invitees, independent contractors or subcontractors emanating from individual designated defense warning areas in accordance with requirements specified by the commander of the appropriate onshore military installation, i.e. Naval Air Training Command, Naval Air Station, Corpus Christi, Texas to the degree necessary to prevent damage to, or unacceptable interference with, Department of Defense flight, testing, or operations activities, conducted within individual designated warning areas. Necessary monitoring control, and coordination with the lessee, his agents, employees, invitees, independent contractors or subcontractors, will be effected by the commander of the appropriate onshore military installation conducting operations in the particular warning area. Provided, however, that control of such electromagnetic emissions shall in no instance prohibit all manner of electromagnetic communication during any period of time between a lessee, its agents, employees, invitees, independent contractors or subcontractors and onshore facilities.

The lessee, when operating or causing to be operated on its behalf boat or aircraft traffic into the individual designated warning areas shall enter into an agreement with the commander of the appropriate onshore military installation, i.e. Naval Air Training Command, Naval Air Station, Corpus Christi, Texas utilizing an individual designated warning area prior to commencing such traffic. Such agreement will provide for positive control of boats and aircraft operating into the warning area at all times.

7. Information to States

Various sections of the OCS Lands Act (43 U.S.C. 1334), as amended, provide for expanding the roles of affected States and to a lesser degree, of local governments acting through their State representatives. States will also share in revenues from lease tracts within three miles of their seaward boundary on which there are joint pools or fields which underlie both Federal OCS and State offshore submerged lands (Section 8(g).). State participation is encouraged in the preparation of a five-year leasing schedule (Section 18); in determining the size, timing, and location of lease sales (60 days review under Section 19); and in the approval of development and production plans (Section 25). Generally, the Secretary must accept recommendations of the Governors if he finds that they provide a reasonable balance of State and national interests (Section 19).

Title 30 CFR 250.34, as revised on November 4, 1975, was modified on January 27, 1978, in 43 FR 3880 (Appendix I). Some of these regulations are being temporarily suspended and revised in the near future. The principal purposes of these regulations are to provide additional information to the States to aid them in planning for potential onshore impacts of oil and gas exploration and production of the Outer Continental Shelf, and to assist the Supervisors in evaluating and mitigating potential offshore and onshore impacts.

These regulations revise and more clearly define procedures for the submission by oil and gas lessees on the Outer Continental Shelf of plans for exploration and development/production activities on the OCS. The regulations also significantly expand the information which States affected by OCS development will receive, and provide commenting procedures for affected States and local governments. Finally, the regulations delineate procedures for determining whether or not an EIS will be required for exploration and development/production plans.

No exploration activities may be commenced on any leased areas until a proposed exploration plan covering that area has been submitted to and approved by the Supervisor. An exploration plan may apply to one or more leases held by an individual lessee, or may be submitted by a group of lessees acting jointly through a unit operator pursuant to an approved unit agreement. The plan must describe in detail all exploration activities contemplated such as those set forth in the text of the regulations (30 CFR 250.34-1). The Supervisor must submit copies of the plan to the Governor of each affected State, that State's coastal zone management agency and to the United States Office of Coastal Zone Management, all within 10 days of receipt of the plan. The Supervisor must consider all comments received and shall respond in writing, giving his reasons for the actions taken. No plan may be approved until comments are received or until 30 days after each affected State receives the plan, whichever occurs first. The Supervisor shall determine whether the plan, as revised if required, complies with the regulations and shall notify the lessee and the affected State of the determination. No operations may be conducted by the lessee until the plan is approved.

No development or production activities may be commenced on any leased area or unit area until a proposed plan of development and production covering that area has been submitted to and approved by the Supervisor. The plan must describe in detail all development and production activities contemplated such as those set forth in the text of the regulation (30 CFR 250.34-2). Thereafter, the same procedures are followed as are set out above in regard to the exploration plan, except that the 30 day comment period of the exploration plan is extended to 60 days as to the development and production plan. All State comments must be considered and responded to in writing.

The exploration plan must be accompanied by an Environmental Report (Exploration) and the development and production plan must be accompanied by an Environmental Report (Development/Production). Both reports must set forth in detail how the plan will possibly affect the environment and its estimate of impact on the affected States, all as set forth in the text of the regulation (30 CFR 250.34-3).

Prior to approval of either of the above plans the Supervisor shall prepare an Environment Assessment, in accordance with applicable policies and guidelines, to determine whether the proposed activities constitute a major Federal action significantly affecting the quality of the human environment requiring preparation of an Environmental Impact Statement pursuant to Section 102(2)(c) of the National Environmental Policy Act of 1969 (42 U.S.C. 4332(2)(c)). In determining whether an Environmental Impact Statement is or is not required the Supervisor must give particular attention to many environmental and impact matters set forth in the text of the regulation (30 CFR 250.34-4).

The Supervisor's assessment is subject to review by the Director and the Supervisor shall transmit copies of the final Environmental Assessment to the affected States. If it is decided to prepare an Environmental Impact Statement, the Supervisor shall not approve any activity described in a plan prior to completion of the review process if that activity would (1) have a significant adverse environmental impact, or (2) foreclose prematurely the subsequent adoption of alternatives to the plan which might have less environmental impact.

8. Fishermen's Contingency Fund

The Outer Continental Shelf Lands Act Amendments of 1978 (PL 95-372) established in the Treasury a Fund not to exceed $1 million for purposes of compensating U.S. commercial fishermen for fishing gear damage or loss and loss of profits resulting from activities related to oil and gas exploration, development and production. The Secretary of Commerce, who administers the Fund, may establish and maintain accounts by area; lessees or any holder of an exploration permit, or easement or right-of-way for pipelines in an area shall be assessed an amount to be credited to that area account. The Secretary of the Interior collects the amount set. The maximum assessment for a calendar year is not to be more than $5,000 per lease, easement or right-of-way. Damages attributable to a financially responsible party may not be compensated from the Fund.

The Secretary of the Interior issues regulations that provide for marking, where practicable, of all materials, equipment, tools, containers and other items used on the OCS with the owner's identification.

The Secretary of Commerce is required to identify and classify all potential hazards to commercial fishing caused by OCS activities. In cooperation with the Secretary of the Interior he is to conduct a two-year survey of obstructions on the OCS and from this survey develop charts for commercial fishermen.

9. Offshore Oil Spill Pollution Fund

This Title provides the procedures to be followed in the event of an oil spill and compensation for cleanup costs and damages resulting from such a spill. It establishes a Fund in the Treasury in an amount not to exceed $200 million. The Fund is administered by the Secretaries of Transportation and Treasury. A maximum fee of 3 cents per barrel of oil obtained from the OCS is assessed the owner of the oil. Claims may be made for economic loss (removal costs and damages) arising from or directly resulting from oil pollution. The Title applies to spills from any offshore facility in the OCS and any oil tanker, barge, or other watercraft operating in offshore waters carrying oil directly from an offshore facility. The owner or operator of a vessel or of an offshore facility is jointly, severally, and strictly liable for all loss under a claim. Except for willful misconduct or gross negligence, total liability is limited to $250,000 or $300 per gross ton for a vessel, and $35 million plus removal and cleanup costs for an offshore facility. Owners/operators of vessels must maintain evidence of their financial responsibility.

Section V

Any Adverse Impacts Which Cannot Be Avoided Should The Proposal Be Implemented

A. Marine Organisms

A minor decrease in primary productivity due to the mortality or functional impairment of phytoplankton, seagrasses and algae will occur in areas of high turbidities generated by drilling fluids disposal and bottom sediments suspended by pipeline laying and burying operations.

The possibility exists that toxic materials used in mud mixtures (such as bactericides) may adversely affect some marine organisms when the drilling fluids and cuttings are discharged into the Gulf. Furthermore, such discharges will bury sessile benthic organisms out to not more than 500 m from the drilling activity.

Community disruption will occur if fresh oil spills reach coastal areas or sensitive biological features. Localized severe mortalities, probably selective, and functional impairment would probably occur, thereby altering the community structure for an unknown period of time.

Routine oil and gas operations will impact marine organisms only in the immediate location of platforms, wells and pipelines. These impacts are considered temporary and minor.

B. Wetlands

No new pipelines are anticipated to come ashore as a result of this proposed sale. However, should any occur, the unavoidable short-term impacts associated with trenching and backfilling for pipeline construction include the uprooting of all plants and non-motile animals in the path of the pipeline, thereby leaving a barren strip 9 to 12 meters wide. Some slight damage may also be rendered to vegetation in adjacent areas by machinery used in the operation. The long-term impacts would likely include salt-water intrusion, changes in floral and faunal components and a possible increase in marsh erosion if the canal is not backfilled.

In the event of an onshore oil pipeline leak or spillage at onshore facilities, it is inevitable that the vegetation would be affected to an extent that would be dependent upon the severity of the spill. While a small leak may do little damage, a severe leak may contaminate the substrate and kill the vegetation that comes into direct contact with the oil and several years may be required for recovery. Small animals in contact with the oil would probably be killed.

A considerable number of beaches and barrier islands are located throughout the area encompassed by this proposed sale. There are no tracts offered in this proposed sale that pose a threat to recreational beaches. However, if any of these beaches are contaminated by oil, an undetermined amount of fish and wildlife habitat (primarily birds) will be damaged. Although large numbers of bird deaths from oil spills have not been documented in the Gulf of Mexico, it is highly possible that a large number of deaths would occur should a large spill reach shore.

C. Deterioration of Air Quality

The air quality near offshore production sites will be affected should this proposed sale proceed. Offshore operations generate a small but significant amount of air pollutants resulting from stationary combustion or from venting produced gas. It can be expected that by 1985 power generation on platforms will contribute to continuous emissions of:

36.3×10^3mg/yr—NO_x

3.12×10^3mg/yr—HC

9.0×10^3mg/yr—CO

1.1×10^3mg/yr—particulate

In most cases, these emissions will be local in nature and be quickly dissipated by climatic conditions. There would not be an increase in air quality degradation onshore.

If a natural gas leak or blowout were to occur, air quality degradation would be minimal. Oil leaks and oil spills which would not be accompanied by a fire would introduce highly volatile, low molecular weight hydrocarbons such as benzene and toluene into the atmosphere. These lighter fractions of crude oil would undergo some unknown degree of degradation, possibly resulting in photochemical smog. If a spill were to result in a fire, large amounts of particulate carbon and oxides of carbon, along with smaller but unknown amounts of sulfur oxides, evaporate crude oil liquids and partially oxidized compounds would enter the air. Local air quality would be severely degraded during the duration of the fire. The extent of degradation cannot be determined but it is unlikely that it would be high enough to effect land resources or human health.

D. Deterioration of Water Quality

Water quality will be temporarily degraded by resuspension of sediment during pipeline construction and burial. The area affected will be in the direction of the current movement. Various other phases of offshore operations (emplacement of re-entry collars, blowout preventers, drilling platforms, etc.) will also cause suspension of bottom sediments in a localized area. The magnitude of deterioration depends on numerous variables, among them bottom type, currents and duration of the activity.

During drilling operations, discharged drill muds and cuttings might adversely affect water quality. The severity of this impact depends upon such factors as the volume and type of mud discharged and the volume and type of cuttings discharged. The turbidity plume that would result from the discharge of drilling fluids and cuttings would be localized. A turbidity plume can extend well over a mile; however, the exact dimensions are governed by winds and currents.

The production and discharge of formation waters (oil field brines) may contribute to water quality degradation when released into the Gulf. Produced formation waters may contain toxic substances, heavy metals, dissolved hydrocarbons and inorganic salts. The heavy metals may include cadmium, chromium, copper, lead, mercury, nickel and zinc, although these are generally present in trace quantities (EPA, 1974). The constituents of these brines may vary from formation to formation and within a single formation.

Water quality will also be somewhat affected by chronic pollutants and occasionally by a more significant oil spill.

E. Interference with Commercial Fishing Operations

As described in earlier sections, trawling operations suffer interference and inconvenience from oil and gas operations in several ways. A small area of the sea floor, up to 50 hectares of sea floor (less than one percent of the total acreage offered) may be occupied by platforms resulting from this proposed sale. Trawl nets reportedly become snagged on underwater stubs, causing damage or loss of the nets. In addition, it is conceivable that such snags could damage underwater production equipment or pipelines, causing a spill of oil and gas. Because safety equipment is installed which shuts in production when a loss of pressure occurs, the likelihood of a major spill resulting thereby is considered very small. Less frequently, large objects which were lost overboard from petroleum industry boats, pipeline lay barges and platforms are caught in trawling nets, resulting in damage to the net and/or its catch of fish; however, frequency of occurrence of this type of incident is low.

Commercial fishermen would probably not trawl in the area of an oil spill, as spilled oil could coat or contaminate commercial fish species, rendering them unmarketable. This would be another adverse effect to commercial fishing.

F. Interference with Ship Navigation

Very little navigational interference can be expected between ships utilizing established fairways. However, at night, and especially during rough water, fog and heavy seas, ships which are not navigating the fairways could collide with fixed structures resulting from this proposed sale. Also, fishing boats engaged in trawling will be inconvenienced by having to navigate around fixed structures located on fishing grounds. Based on U.S. Geological Survey estimates, 10–25 new platforms could result from this proposed sale; although the increment is small in comparison to the more than 2,000 structures existing in the Gulf of Mexico, it still represents a potential increase in possible interference with ship navigation.

G. Cultural Resources

Remote sensing geophysical surveys with professional archaeological interpretation are not 100 percent effective. There remains therefore some small chance that oil and gas operations in the 72 tracts included within the cultural resource demarcation line will adversely affect unknown and undetected cultural resources. Likewise there is a small probablility that an unknown cultural resource exists within the 43 tracts outside the cultural resource demarcation line; therefore, there is a very small probability that oil and gas activities within these tracts would adversely affect unknown significant cultural resources.

Should oil and gas activites interact with unknown cultural resources anywhere offshore, the adverse impact would probably be minor; however, it could be significant. The most likely adverse impact would be a minor disruption of the contextural relationship on a scattered archaeoligical assemblage lying on or very near the seafloor.

Should oil pollution from an accident resulting from this proposal impact cultural resources onshore, some adverse impact can be expected.

H. Interference with Recreation Activities

Oil spills from lease tracts or transportation modes which may occur as a result of OCS oil and gas operations could result in unavoidable adverse effects on recreation areas affected by tidal action and hence, coastal recreation activity. Even though all of the 580 km of the Gulf recreation shoreline from Texas to Alabama are susceptible to oil spill damage from this proposal, it is unlikely that the millions of recreation activity days associated with the coastal area will be significantly affected. Since recreation is a primary use of the shoreline along the central and western Gulf of Mexico, it is inevitable that some of the crude oil or its residues and other forms of debris inadvertently introduced into the marine environment offshore will adversely interfere with some nearshore and shoreline recreation resources and activities. Such occurrences are most likely to affect shoreline aesthetics and be perceived as minor nuisances but could result in the localized shore-term curtailment and/or dislocation of recreations participation.

I. Other Land Uses

It is anticipated that present capacity in the existing gas and oil related infrastructure in the coastal zones of the adjacent states is expected to absorb the land use requirements related to this proposed sale. A total of 0–40 ac required for 0–2 terminal storage facilities may possibly be the only incremental land use demand induced by this proposed sale. This acreage is very small, and there is undoubtedly additional acreage available in the areas of existing infrastructure development which could host such facilities. If properly sited in accordance with local comprehensive land use plans, possible additional onshore development should present no conflict with other land uses.

J. Summary

In summary, all unavoidable adverse impacts that will be sustained by the natural environment as a result of routine operations will be relatively localized in their effects. Many will be followed by unhindered natural recovery within relatively short time periods. A massive accidental oil spill could result in short-term severe and widespread damage of major consequence. All of the tracts identified for oil and gas production in this proposed sale do contain varying degrees and types of adverse impact potentials but only a massive oil spill accident would result in significant adverse impacts. However, the probability that such a massive spill will occur is relatively low.

Section VI

Relationship Between Local Short-Term Uses Of Man's Environment And The Maintenance And Enhancement Of Long-Term Productivity

As indicated in Section III, the operations resulting from this proposed lease sale, if it is held, will have a small, localized, and short term effect on some of the living resources of the Gulf of Mexico Outer Continental Shelf. Some plants and animals will be killed, and some areas will be eliminated as habitat. On the other hand, platforms constructed in the Gulf will provide some new habitat. In any event, the long term effects on the biota from OCS oil and gas operations are considered to be very small: if all such operations were to cease tomorrow, and all platforms and unburied pipelines removed, within a few years the biological communities would probably return to pre-drilling levels and compositions, barring other natural and man-made disturbances. Even an oil spill would probably have only short-term effects on the biota (i.e., several years if contained and cleaned up properly) despite its visibility and seemingly disastrous nature at the time of the spill.

The induced development may result in short-term adverse impacts to communities. A strain on existing infrastructure would be expected if new OCS-related facilities are located in areas of low population with little current industrial base. However, in the long-term, an adjustment can be expected as population gains and induced industrial development are absorbed in the expanded communities. Land utilized for facilities directly associated with OCS operations will be excluded from other uses over the 25-year life of the field; however, only a portion of this land area may continue to be so utilized after production ceases.

The major tradeoff, then, between short-term use and long-term productivity involves the mineral resources, specifically oil and gas, and the effects of such minerals on economic conditions such as employment, production of other products, use for heat and light, and use in transportation. Over the short-term, oil and gas is needed for these uses. But if it isn't produced on the OCS of the United States, it will probably be imported. Such importation will have its own effect on employment in the U.S. gas and oil industry and perhaps on the price of oil and gas. Also, producing U.S. OCS oil and gas now will preclude the use of that oil and gas in the future when imports may be unavailable. This is the most important long-term commitment that would result from this sale: the use now of resources that may be needed in the future.

Since initial OCS development off Louisiana in the 1950's recreational fishermen, scuba divers, and some commercial fishermen have focused greater and greater attention on pursuing their vocations and avocations around offshore platforms. This has stimulated a surge in the manufacture and sale of larger private fishing vessels and specialized fishing and recreational equipment. Additionally commercial enterprises such as charter boats have become heavily dependent on offshore structures for satisfying recreational customers. This proposed sale will increase these incidental benefits of offshore development. The 10-25 platforms expected to result from the proposed action will help replace those currently being removed where production has terminated. As the incidence of offshore fishing and diving has gradually increased in the past three decades, the focus of much of that activity, platforms, will eventually begin to gradually decline as mineral resources become depleted. In order to maintain the long term productivity of site specific artificial locations attractive to fishermen and divers, some means, such as proliferation of artificial reef development programs, will need to eventually replace platform removals.

If this sale were not to be held (or more accurately, not to be held at this time) offshore industry employment would be reduced, but other employment should remain about the same, since increased imports would probably be used to make up for decreased Gulf OCS production. In the future, when this OCS oil and gas would be produced, offshore employment would then increase.

If this sale is not held, or exploration and production activities in the Gulf of Mexico do not continue, the most probable result will be a continuation in the decline of oil and condensate production in the Gulf of Mexico. If this decline occurs, it is probable that the refining centers in the Gulf of Mexico will utilize additional crude oil from other areas. To the extent that this oil is transported by tanker to the refineries, a potential impact to the long-term productivity of other resources would be present due to the potential for oil spills attributable to marine transportation activities.

Development of OCS oil and gas must be a part of a national energy policy which considers all forms, uses, and sources of energy. It is in such a context that the decision to hold this proposed sale or not will be made by the Secretary of the Interior.

Section VII

Any Irreversible And Irretrievable Commitment Of Resources Which Would Be Involved In The Proposed Action Should It Be Implemented

A. Mineral Resources

Leasing of the proposed tracts in this sale would permit development and extraction of the minerals contained herein. This proposed lease sale could result in production of 20–60 MMB of oil and .36–.893 trillion cubic feet of gas which would represent an irreversible and irretrievable commitment of these mineral resources.

More than one mineral lease may be issued for the same area for the retrieval of other types of minerals, but CFR 43, Part 3307, 4–5 provides that other leases may not unreasonably interfere with or endanger operations of any existing lease.

Other mineral resources in the form of fuels required for exploration, production, and transportation of resources discovered and produced as a result of this sale would be irretrievably committed.

Exploration, production, and transportation of the sale related hydrocarbons would require the use of fabricated metal products. Although recovery of some portion of these products could be carried out at the end of oil and gas related activity, some of these mineral products would be irretrievably committed.

B. Land Resources

It has been estimated that 0–2 terminal storage facilities may result from this proposed sale. This would represent a long-term use of land resources, but not an irreversible and irretrievable commitment.

Since no major trunklines are anticipated to result from this sale, no permanent dedication of land resources for pipeline right-of-way purposes is anticipated. Incremental additions of pipeline right-of-way will be required on the Outer Continental Shelf in order to connect new producing facilities to existing pipelines. Areas required for this purpose, as well as the area required for platform installation would be withdrawn during the life of production, but these uses would not be irreversible and irretrievable in nature.

The continued use of existing facilities within the oil and gas related economies of the states bordering the Gulf of Mexico implies that to some extent land resources may be committed to longer periods than would otherwise be anticipated, but probably not in an irreversible and irretrievable manner.

Some facilities, such as refineries, are not completely dependent on OCS production for their continued operation, although continued OCS production could be conceived as one factor that may have some marginal effect in inducing the continued utilization of an existing facility.

The states bordering the Gulf of Mexico contain the home areas of persons engaged in the exploration, production, and transportation of oil and gas produced from the OCS, as well as production from areas located onshore and in state marine waters. To the extent that these persons are employed in activities related to the Outer Continental Shelf, their continued employment would imply the continued use of existing dwellings and land areas required for residential uses, as well as land areas required for commercial and other uses which meet the needs of these residents for goods and services.

C. Biological Resources

An irreversible or irretrievable commitment of biological resources could occur in the area of a massive oil spill or in an area frequently subjected to chronic low-level oil pollution. However, it is anticipated that once an area recovered from a spill that the natural fauna (excluding an endemic endangered species population) would reoccupy a vacated habitat.

In the event that an oil spill of sufficient magnitude, or some other adverse impact related to OCS operations, resulted in severe losses to the population of an endemic endangered species, it is possible that an irreversible and irretrievable commitment to the extinction of this species would have been made in the area impacted.

D. Cultural Resources

Any damage to archaeological sites or historic resources will comprise an irretrievable commitment of non-renewable resources. To the extent that heretofore unknown early man living sites or historic shipwrecks lost from the times of America's discovery through World War II could be avoided by careful location of OCS facilities, no irretrievable commitment of these resources would result from activities related to this proposal. Considering that the existence of an early man living site on the OCS has yet to be substantiated and a few thousand historic ships known to have been lost in the Gulf of Mexico are scattered over and under millions of acres of seafloor, the likelihood of site-specific operations from OCS activities from 5 to 200 km offshore encountering such resources is considered remote. It is believed that the stipulation proposed for this sale (See Section IV.D.) combined with OCS Orders and regulations of the USGS, and the coordination that takes place between BLM, USGS, HCRS, and the National Park Service, as well as the adjoining affected states, will serve to ensure that every practicable effort to avoid damage to cultural resources from OCS operations is being undertaken.

E. Human Resources

From 1970, through December 1976, there have been 102 deaths and 162 injuries directly associated with drilling operations in the Gulf of Mexico. In addition, there have been numerous deaths associated with oil and gas production on the OCS including helicopter crashes and boat accidents. It will be impossible to avoid all human casualties, but they have been minimized through measures already implemented which are continually updated to improve the safety of OCS operations. Fatalities and/or permanent impairment as a consequence of accidents and personnel error will result in an irreversible and irretrievable commitment of human resources.

During the period when sale related activities were being carried forward, skilled personnel would be employed in many activities such as exploration, production, and transportation. To the extent that their efforts were devoted to sale related activities during a period of time, their services could not be employed in alternative areas. Therefore, an irreversible and irretrievable commitment of skill, knowledge, and labor will result from this sale.

F. Economic Resources

A decision to proceed with this proposed sale would result in production of certain OCS-related goods and services, including investments in required facilities, stimulation of certain industries within the region, and if recoverable resources are proved, oil and gas. To the extent that resources would be drawn away from other uses, production of goods and services in other areas or of other types would possibly have to be foregone. Steel products, specialized manpower and capital constitute required resources which may be the scarcest, and use of these resources to develop this proposal would mean that other opportunities for their use might have to be foregone. While these resources may be reclaimed over time, their use as a result of this proposed sale would constitute an irreversible and irretrievable commitment of resources during a period of time.

To the extent that unemployed resources are used, the employment of resources as a result of this proposed sale would not constitute a cost to society in the form of foregone opportunities.

G. Energy Resources

Extracting the estimated oil and gas reserves to be produced from this proposed sale would be an irreversible commitment of raw energy resources. During exploration and extraction, energy resources would also be consumed for manufacturing and transporting the supplies and equipment required in these activities as well as for onshore and offshore transportation of the required labor force.

Processing and transporting any production resulting from the proposed sale will require the use of additional energy resources; however, onshore processing and transportation energy requirements would probably be utilized for the imported hydrocarbons necessary to replace potential sale production.

Energy resources that would be irretrievably committed as a result of the proposed sale include electricity, gasoline, diesel fuel, coal, lubricants, and hydrocarbon production from leased tracts.

Section VIII

Alternatives To The Proposed Action

A. Modify the Sale

1. Withdraw Tract 115 and Tract 118

A possible alternative to the proposed action is the deletion of tract 58A-115 near the East Flower Garden Bank and tract 58A-118 near the West Flower Garden Bank. Such deletion would ensure that these unique biological feature would remain clear of any oil and gas development resulting from this proposed sale, although the banks would still have oil and gas activity in the vicinity as a result of previous sales. Adoption of this alternative would incrementally decrease the exploration activity that may result from this proposed sale and possibly also incrementally reduce the amount and number of offshore facilities that would be required. Withdrawal of these tracts could lower the activities of this proposed sale by four exploratory wells, two platforms, and 20 development wells. This decrease in the estimated number of wells could reduce by twenty-two thousand tons the drill cuttings and drilling fluids produced.

Furthermore, EPA is considering attaching a number of restrictive conditions to NPDES permits which they may issue for discharges occurring during oil and gas operations in the Gulf (section IV.D.6.), even though no such permits have been issued to date (November 1978). These tracts are within the 6 nmi circle in which EPA would prohibit any discharge whatsoever into the Gulf. It would seem that such a restriction, if imposed by EPA, would render these tracts rather unattractive to potential bidders. A variation of this alternative would be to withdraw this tract from consideration for leasing for the five years corresponding to the NOAA proposed moratorium on leasing. Subsequent to the end of the moratorium, leasing might be reconsidered depending on the results of studies proposed for the moratorium period.

Notwithstanding all of the above, the Department is convinced that the restrictive measures to be imposed on these tracts by lease stipulations imposed by the Department are adequate and sufficient to protect the biota of the banks from the effects of oil and gas activities.

ENVIRONMENTAL EFFECTS:

Should these tracts be leased with proposed Stipulation 2, Parts D. and E. attached, no structures, drilling rigs or pipelines would be allowed within a boundary described by aliquots which enclose the 85 meter isobath, around the East and West Flower Garden Banks. Deletion of the tracts would result in the further exclusion of structures between the 85 meter isobath and the 100 meter isobath of each tract, which fall within NOAA's definitions of the banks, as well as the rest of both tracts. Deletion would eliminate the possibility of mechanical damage to all substrate and communities within both tracts, including communities outside of the banks themselves.

If the tracts were to be leased with the proposed stipulation attached, the following restrictions would apply:

1. Within one nmi of the 85 meter isobath, all drill cuttings and fluids must be shunted to within no more than 10 meters from the bottom, and a comprehensive monitoring plan must be implemented,
2. From one nmi to three nmi from the 85 meter isobath, all drill cuttings and fluids must be shunted to within no more than 10 meters from the bottom,
3. No waste may be disposed of from vessels,
4. No halogenated phenol bactericides may be used.

The zones encompassing the requirement for both shunting and monitoring, and the restriction on structure placement, together cover over half of tract 115 and about one third of tract 118. Shunting would be required on the remainder of both tracts.

Should the tracts be deleted, no drilling muds or cuttings or waste would be disposed of in any manner on the entire area of either tract, including the area between the 85 meter isobath and the 100 meter isobath which NOAA, unlike BLM, includes in its definition of the extent of the banks. Elimination of the tracts and resulting disposal of cuttings, muds and waste would further reduce the potential for damage due to smothering, turbidity or toxicity which might be posed by such disposal.

NOAA is proposing five years of additional studies of the possible effects of oil and gas operations on the banks. Elimination of these tracts would also allow implementation of any protective measures recommended as a result of these studies, should this tract be withdrawn and leasing reconsidered after the five year study period.

Table 56

Replacement Energy Needs

	Billion Btu/day
1. Btu equivalents:*	
Oil - 6,800-18,000 bbl/day	38-101
Gas - 190,000-470,000 thous.cu.ft./day	194-480
Total	232-581
2. Oil equivalents:	Bbl/day
Oil from other sources needed to directly replace expected oil production	6,800- 18,000
Oil from other sources needed to replace expected gas production	34,643- 85,714
Total	41,443-103,714
3. Gas equivalents:	MMcf/d
Gas from other sources needed to replace expected oil production	37- 98
Gas from other sources needed to directly replace expected gas production	190-470
Total	227-568
4. Coal equivalents:	Thousand short tons/day
	9.6-24.2
5. Electrical equivalents:	Megawatts of capacity
Substitutes for end uses**	1,895-4,822
Substitutes as input to electricity generation***	933-2,374

Notes: * Conversion factors used:

1 barrel of oil = 5.6 x 10^6 Btu.
1 cubic foot of natural gas = 1,021 Btu.
1 ton coal = 24 x 10^6 Btu.
1 kilowatt hour = 3,412 Btu at the theoretical conversion rate of other energy forms to electricity at 100 percent efficiency.

** Based on a 65 percent average efficiency of end use of oil and gas (such as oil and gas heating) and a plant load factor of 80 percent.

*** Efficiency of fossil fuel electricity generation was assumed to be 40 percent. Efficiency of present fossil fuel generation averages about 33 percent.

2. Withdraw Tracts in Deep Water

The number of tracts that would be included under a general alternative to delete specific deepwater blocks is uncertain, due to a lack of a proper definition of the limits of deep-water technology.

Several factors which might influence the consideration of deleting deepwater tracts include:

—Depth limits of existing technology

—Deepwater systems under design by industry

—EPA definition of deepwater (greater than 300 meters). This definition would result in deletion of six tracts: 109, 110, 111, 112, 113, and 114.

World-wide exploratory operations have been safely conducted in water depths of greater than 1350 meters (4428 ft.). Drill ships and marine risers have been designed for water up to 1830 meters (6000 ft.). The deepest tract in the proposed sale extends to 500 meters (1640 ft.). The deepest standard jacket-type steel structure stands in 312 meters (1023 ft.), and subsea completion prototype production systems designed for depths around 600 meters (1970 ft.) are already in existence. Pipeline installations have been tested in water as deep as 610 meters (2000 ft.). Development of systems to lay pipe in deeper waters is underway.

Thus, one cannot realistically designate a finite limit of offshore technology. For each of the examples given above, the technological advances necessary to attain those depths were not demonstrated in practice until a desireable leasehold or drill-site with potential resources was available to the industry.

Section I.A. contains a discussion of the state-of-the-art of deepwater technology. It is apparent that industry is already far advanced in its consideration, design and testing of systems capable of operating, producing and transporting hydrocarbons at depths at and in excess of those to be found on Proposed Sale No. 58A tracts.

Because the development and trial testing of new deepwater technology has not, significantly in the past, proven to be hazardous, this deletion alternative may not decrease the *risks* of adverse environmental impacts to any level lower than already considered in the original proposal. The environmental effects would be generally the same as for the proposal.

B. Withdraw the Sale

Another option is to cancel the proposed sale. This alternative would reduce the future OCS oil and gas production and would thus likely result in increased imports to make up the lost production. More, over the longer term some possibility of reduced energy consumption by reducing demand or supply shortfalls, or the development of alternative energy sources, or a combination of the above measures could take place.

Therefore, alternative energy measures to offshore oil and gas include:

- Energy conservation
- Conventional oil and gas supplies
- Coal
- Nuclear
- Oil shale
- Hydroelectric power
- Solar energy
- Energy imports
  - Oil imports
  - Natural gas imports
  - Liquified natural gas imports
- Geothermal energy

Other energy sources (wind, tidal). Table 56 estimates the energy required from other sources to replace the expected petroleum production from this proposed sale. A discussion of energy alternatives and their impacts can be found in the "Final Environmental Impact Statements, Volumes 1-3, Proposed Increase in Oil and Gas Leasing on the Outer Continental Shelf" by the U.S. Department of Interior, 1975. A further discussion of alternatives can be found in "Energy Alternatives: A Comparative Analysis" by the Science and Public Policy Program of the University of Oklahoma. Copies of this study are available for review in the New Orleans OCS Office, and can be purchased for $7.45 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20404 (Stock Number 041-011-00015-4). A brief discussion of these alternatives follow.

1. Energy Conservation

a. Description

Vigorous energy conservation is an alternative that warrants serious consideration. The Project Independence Report of the Federal Energy Administration claims that energy conservation alone can reduce energy demand growth by 0.7 to 1.2 percent depending on the world price of oil. Aside from these savings, it is now widely recognized that wasteful consumption habits impose social costs that can no longer be afforded.

The residential and commercial sectors of the economy are often characterized as inefficient energy consumers. Inadequate insulation, inefficient heating and cooling systems, poorly designed appliances, and excessive lighting are often noticed in these sectors. Reductions in consumption beyond those induced by fuel price increases could be achieved by new standards on products and building, and/or subsidies and incentives. Such incentives include standards for improved thermal efficiency in existing homes and offices and minimum thermal standards for new homes and offices.

Excessive consumption is also evident in the industrial sector where energy inefficient work schedules, poorly maintained equipment, use of equipment with extremely low heat transfer efficiencies, and failure to recycle heat and waste materials are all commonplace. Estimated energy savings of 10-30 percent may be available in this sector of the economy.

Transportation of people and goods accounts for approximately 25 percent of nationwide energy use. Energy inefficiency in the transportation sector varies directly with automobile usage. Automobiles, which account for 90 percent of all passenger movement in the nation, use more than twice as much energy per passenger mile as buses. Moreover, the average car carries only 1.3 passengers. Using short- and mid-term conservation measures such as consumer education, lower speed limits, rate and service improvements on public transit and rail freight transit, energy savings of 15-25 percent might be achieved.

Other policies which could encourage fuel conservation in transportation include standards for more efficient new autos and incentives to reduce miles traveled. An important new development in the fuel economy area could be the modification of the standard internal combustion engine. Although such an engine is now in the advanced stages of development, further study by automotive engineers, industry, and concerned federal agencies is necessary before an acceptable engine may be developed.

Significant energy savings are clearly possible through accelerated conservation efforts. The Project Indenpendence Report estimates that conservation alone could result in a 2.2 million barrel per day reduction in petroluem demand by 1985. These savings will be necessary in order to achieve the goals of energy self-sufficiency. In addition, several of the strategies mentioned above have been at least partially implemented by the Energy Policy and Conservation Act of 1975 (P.L. 94-163).

B. ENVIRONMENTAL EFFECTS

The environmental impacts of a vigorous energy conservation program will be primarily beneficial. The exact nature and magnitude of these impacts will depend on whether there is a net reduction in energy use or whether the reduction is accomplished through technological change and substitutions. For the former, the net impacts will simply be that there are fewer pollutants of all kinds unleashed. As an example, the 2.2 million barrel per day savings by 1985 mentioned above would result in a diminishment nationwide of various pollutants by the following amounts. (HUD Contract H2026R).

CO—4 lbs./1000 gals = 189 tons/day

Hydrocarbons—3 lbs./1000 gals = 142 tons/day

Particulates—23 lbs./1000 gals = 1088 tons/day

NO_x—60 lbs./1000 gals = 2838 tons/day

$SO_2$157 lbs./1000 gals = 7426 tons/day

However, if energy conservation is achieved by technological change or substitution, the net reductions will be those above, less the incremental pollutants from other sources, as well as any new pollutants which might arise from these other sources.

2. Onshore Oil and Gas Supplies

A. DESCRIPTION

Large quantities of oil and gas still remain in the United States. The U.S. Geological Survey estimates that onshore crude oil measured reserves as of December 31, 1974, were about 31 billion barrels, indicated reserves were 4.33 billion barrels, inferred reserves were 20.4 billion barrels, and undiscovered recoverable resources ranged from 37 billion barrels with a 95 percent probability to 81 billion barrels with a 5 percent probability.

Despite the magnitude of reserves, domestic oil production is likely to continue to decline from its peak production rate attained in 1970. All of the twelve oil production forecasts discussed in the Project Independence Blueprint claimed that, in the next few years, the U.S. petroleum production decline would continue. Most of these same forecasts predict increasing domestic production by the late 1970's, but only under the most favorable conditions in terms of prices, development of OCS resources, regulations, and environmental constraints.

The development of new reserves required to meet gas demand will depend on continued development of onshore areas and of commercially viable muclear stimulation or massive hydraulic fracturing to produce natural gas from low permeability reservoirs. Additional domestic oil reserves are recoverable through secondary and tertiary extraction techniques. However, the additional oil that is attainable in this manner is many cases "old" and hence has been subject to price controls. These controls have diminished the incentive for using these sophisticated and expensive recovery methods, although continued consideration is being given to the level of incentive required.

One study of future natural gas production rates concluded that the upper production limits of natural gas are now being approached. (Duane and Karnitz, 1975). Two constraints are indentified: the level of recoverable resources, and the production level that can be sustained for a reasonable time period. Once assumptions of these two levels are made, there is not much room for variations in the maximum potentially attainable production rate. Assuming the current Potential Gas Committee's estimate of recoverable domestic natural gas resources (1845 tcf for the U.S. including Alaska), the study considers two possible levels of natural gas production: 25 to 30 tcf/year under optimistic conditions, and 20-25 tcf/year under less optimistic conditions.

To substitute directly for the subject sale, a combination of onshore and OCS production from other areas and continued foreign imports would be required to make up for the estimated total production of this proposed sale of 0.28 to 1.0 billion barrels of oil and 1.9 to 6.8 trillion cubic feet of gas, over a 20-year period.

B. ENVIRONMENTAL EFFECTS

This substitution would entail environmental impacts such as land subsidence, soil sterilization, and disruption to existing land use patterns. Equipment failure, human error, and blowouts may also impair environmental quality. Moreover, poor well construction, particularly in older wells, and oil spills can result in ground and surface water pollution.

The magnitude of these impacts would depend on whether the increased production resulted from improved recovery methods or new discoveries. If improved recovery is realized, the impacts will likely be of little significance and will occur in already developed areas. Should new discoveries be found, the impacts will be more significant and disruptive, as the whole new infrastructure would have to be built from the ground up.

The water pollutants from onshore oil production are oil and dissolved solids. The amounts of each vary over a wide range.

Air pollutants (particulates, NO_x, SO_x, hydrocarbons and CO) result from blowouts and subsequent evaporation and burning. These are generally insignificant, excpet locally. These effects will be basically the same, whether the production is on or offshore.

Given the fact that onshore supplies are dwindling, the South Atlantic States would have to continue their reliance on other regions and foreign imports for needed oil and gas. The decline in these supplies, even with energy conservation, could mean further unemployment, higher consumer prices, and changes in standard of living. The lack of natural gas will mean additional use of "dirtier" alternative fuels (oil, coal) with consequent impacts on air quality and human health.

3. Coal

A. DESCRIPTION

Coal is the most abundant energy resource in the U.S. Coal deposits underlying nearly 460,000 square miles in 37 States constitute one-quarter of the known world supply and account for 80% of our proven fuel reserves. Proved reserves of coal contain 125 times the energy consumed in 1970.

To replace the energy expected to be realized from this proposed sale, 1 to 2 million tons of coal per year would be necessary. Though domestic reserves could easily provide this quantity, serious limitations to coal development exist. Although power generated by water and coal is an important component in the energy supply pattern of the Southeastern U.S., in many uses, coal is an imperfect substitute for oil or natural gas. In many other cases, coal use and production is restricted by government constraints, limited availability of low sulfur deposits, inadequate mining, conversion, and pollution abatement technology, and the hazardous environmental impacts associated with coal extraction and electricity generated from coal. Coal production is also threatened by the unique set of labor problems associated with mining and new strict standards for coal mine safety.

Although U.S. coal resources are very large, as with other extractable mineral fuels, there is some geographic dislocation. Most of our coal is found west of the Mississippi River far from the industrial areas of the South Atlantic. The Eastern Province contains only 9 percent of the total estimated domestic coal resources. However, it contains 80 percent of the remaining identified high-rank bituminous coal. Also, much of the western coal is in arid or semi-arid areas where scarcity of water could constrain development.

The portion of the demonstrated reserve base that is available for use depends on whether the coal deposit can legally be mined, and if it can, whether it is suited for underground or surface mining. Surface mines may recover up to 90 percent of the coal in a given mine; underground mines may recover 50 to 60 percent using room and pillar methods. Both underground and exposed coal deposits are found in the Eastern province. However, statistics indicate that at the 1972 price only 12 percent of the total resource could be considered economically recoverable. As with other extractable hydrocarbons, the quantity of available coal is a function of coal's market price. Current increases in the market price for coal are making more of this resource base available for domestic consumption.

If an alternative to this proposed sale is greater reliance on coal, it may be expected that mining would increase in either the eastern (dependent on acceptability of high sulfur coal) or western states to provide the necessary fuel source. The closest area of known coal reserves to the Southeastern U.S. region is Alabama.

Current estimates for development of coal resources indicate approximately 5 years would be necessary for opening a new coal mine (BLM 1975). If electric generation were to take place at the mine site, approximately 8 years lead time would be necessary. Due to existing air quality in the region, it is unlikely that such a coal burning facility would be allowed under present EPA standards unless waivers are granted or technology could keep particulate emissions at acceptable levels. Synthetic gas production would take a maximum of 10 years from lease issuance to gas delivery.

B. ENVIRONMENTAL EFFECTS

Utilization

Combustion of coal results in various emissions, notably SO_2 and particulates. If the expected production from this sale is replaced by coal, there will be an increase in these pollutants, especially if coal is substituted for the natural gas presently used. Technology to control these emissions is available but has not yet been proven sufficiently to be widely applied. The sulfur content of eastern coal varies considerably but approximately 65 percent of the developed resources have a sulfur content exceeding 1 percent. Most of the U.S. low sulfur coal is located in the western states, far from major markets in the South Atlantic area. Any large scale shift to coal would require relaxation of emission regulations or improvement of technologies to convert coal to gaseous or liquid fuels.

Surface Mining

The 1 to 2 million tons per year of coal that would be necessary to replace production from this proposed sale would require up to four large open-pit miles (assuming 5 x 10^6 tons annually each). The primary impact of surface mining is disruption of the land. This affects all local flora and fauna, water quality, and increases landscape problems due to erosion and runoff from the mines. Reclamation is difficult in the western states due to the lack of water to assist in revegetation. Other problems include acid mine water drainage, leachings from spoil piles, processing waste, and the disturbance caused by access and transportation. Noise and vibration resulting from operations can also be expected. Finally, surface mining causes conflicts with other resources uses (agriculture, recreation, water, wildlife habitat, as examples).

The land use of strip-mining ranges from 0.18 to 519 acres/10^{12} BTU extracted, depending on seam thickness and Btu content of the coal. Assuming a ball park figure of two acres/10^{12} BTU, the annual surface disturbance to substitute coal for oil and gas from this proposed lease sale could range from 39 to 100 acres. Hence this disturbance is incremental, the total impact, assuming a 25-year field life, could be as much as 1.5 to 4 square miles per year.

Underground Mining

To replace the expected production from this proposed sale, one underground mine would be required (assuming 2 x 10^6 annual tons). Underground mining primarily affects land and water quality. The land impacts are those that arise from subsidence, waste disposal, and access and transportation. Very little surface is disturbed. Subsidence can destroy structures, cause landslides and earthquakes, and disrupt groundwater circulation patterns. The amount of subsidence can be controlled by mining method used and the amount of coal removed. Both have detrimental effects on the economics of the operation.

Water quality is affected by both processing waste and the drainage of acid mine-water into surrounding areas. These can be minimized through the proper methods of control both during and after operations. Entrances can be sealed, waste piles can be replaced in the mine. This would also help minimize subsidence. Also, there are pollution problems associated with road and coal dust and the like, but these are minimal and easily controlled. Other disturbing aspects of mining have much less of an impact in an underground than a surface mine. Working conditions of underground mines have been improved under the Federal Coal Mining Health and Safety Act of 1969, although further efforts are needed to reduce health hazards. This program has resulted in increasing costs of underground mining relative to surface mining, which has even more severe environmental restraints and impacts.

Transportation

The five major transportation systems (road, rail, water, conveyor, and pipeline) all have some adverse environmental impacts. These include air and noise pollution, safety, land use, trash, disposal, and aesthetics. However, since spill problems are not associated with coal, most of the impacts can be controlled with greater care and consideration. A slurry pipeline also requires large supplies of water and must adequately dispose of this at the other end. Water availability is a problem in many areas of the U.S., especially in the west where energy resource requirements will have to compete with other existing commercial and private users for a limited and fragile supply. Construction of such slurry pipelines over long distance to this area from the coal-abundant States would involve extensive costs that may not be economically feasible for many years yet to come.

Conversion

Technology for conversion of coal into gaseous and liquid hydrocarbons has been established for several decades and a number of relatively low-capacity commercial plants exists in various parts of the world. However, few cost-effective advanced technologies have progressed beyond the pilot plant stage.

Numerous problems remain before commercial development of synthetic fuels from coal can proceed. Specific technical problems must be solved. The cost effectiveness of synthetic fuels from coal will depend on prices of other fuels, primarily oil and natural gas.

Control of adverse environmental effects will increase the cost of producing synfuels. Possible constraints on development include technological constraints; availability of skilled workers, raw materials (coal, water, steel), capital; and institutional constraints; Government policies (energy resource leasing, coal mining regulations, permit procedures, etc.), and the willingness of industry to invest in development of new technologies. Present prices for synthetic natural gas are $5.35 per thousand cubic feet versus about $3.00 for conventional natural gas at the burner tip in the Southeastern U.S.

Synthetic oil and gas could contribute substantially to energy supplies by the year 2000—up to 14 percent according to the Synfuels Interagency Task Force (Report to the President's Energy Resources Council, November 1975). However, the most important contributors would be high-Btu gas for coal, and synthetic crude oil from oil shales. Prospects from coal liquefication and low-Btu gas appear less attractive. The success of these energy sources will depend on developing technology, the cost of the impacts, especially coal, and the cost of conventional oil and gas.

Gasification

Gaseous fuels with low, intermediate, or high energy content can be produced. Low and intermediate gases are produced in a two-stage process involving preparation and gasification, and the output is utilized as feedstock for electric generators. A third process, upgrading, is required to produce high-Btu gas, which produces an end product useable by the consumer.

Among low-Btu gasification processes under development are: Lurgi, Koppers-Totzek (both in commercial use), Bureau of Mines Stirred Fixed Bed, and Westinghouse Fluidized Bed. Among High Btu-gasification processes are: Lurgi high-Btu gasification process, HYGAS, BI-Gas, Synthane, and CO_2 Acceptor.

The environmental impacts of coal gasification are those of mining plus those resulting from the production processing. Gasification processes have lower primary efficiency than direct coal combustion; more coal will have to be gasified to reach an equivalent Btu output. However, it is likely that coal gasification will achieve primary efficiencies of 70 percent, which is about twice that of coal to electricity end use (Hale, 1975). Water impacts of processing can be minimized by recycling and evaporation. However, large inputs of water are required for some of the technologies, thus creating the potential for conflicts in water-short areas. For example, a Koppers-Totzek gasifier producing 250 10^9 Btu per day will require water in the amount of 463,000 gallons per day and coal in the amount of 10,570 tons per day. To substitute for this proposed sale, one complex would require from .1 to .25 million gallons of water per day and one to two million tons of coal per year. The land use required for this plant, if it were to be located in this region, would be 330 acres.

Air pollution could include sulfur dioxide, particulates, nitrous oxides, hydrocarbons, and carbon monoxides.

Land impacts result from solid waste disposal plus the land use for plant, coal storage, cooling sands, etc. Solid wastes include ash, sulfur and minute quantities of some radioactive isotopes.

Liquefaction

As with coal gasification, production of liquid fuels from coal requires either addition of hydrogen or removal of carbon from the compounds in the coal. Coal liquefaction can be viewed as a change in the carbon to hydrogen ratio that can be accomplished by one of these reactions: hydrogenation, pyrolysis, or catalytic conversion. Of these, only the last is the commercial operation. Among liquefaction processes under development are: Synthoil, H-Coal, Solvent Refined Coal, Consol Synthetic Fuel, COED, TOSCOAL, and Fischer-Tropsch.

Again, the impacts of liquefaction will be those of mining and those of the processing plants. The available technologies have a recovery of from 0.5 to 3 barrels of oil per ton of coal processed.

Water effluents from liquefaction plants could contain amounts of phenols, solids, oil, ammonia, phosphates, and others. The waste water could be treated to remove most of these.

Air pollution could result from particulates, nitrogen and sulfur oxides, and other gases. Pollution control facilities would be required, but would lower the economic attractiveness of the plants.

Solid wastes would be mostly ash. Residue could be buried in the mine with little further environmental impact, if liquefaction plants are sited at the mine mouth.

Impacts from this alternative would probably be absorbed by States other than those on the Gulf coast.

4. Nuclear Power

A. DESCRIPTION

The predominant nuclear system used in the U.S. is the uranium dioxide fueled, light water moderated and cooled nuclear powerplant. Research and development is being directed toward other types of reactors, notably the breeder reactor and fusion reactors.

As of December 31, 1975, 56 nuclear plants with capacity of 37,500 MW were licensed to operate. At the end of 1975, nuclear power generated about 8 percent of the nation's electricity. However, about half of the electric power capacity now under construction is nuclear powered. Nuclear power development has encountered delays in licensing and siting, environmental constraints, and manufacturing and technical problems. Future capacity will be influenced by the availability of plant sites, plant licensing considerations, environmental factors, nuclear fuel costs, rate of development of the breeder and fusion reactors, and capital costs. In order to meet future uranium fuel requirements, it will be necessary to locate additional ore reserves through increased exploratory drilling activity.

Fuel cycle costs of nuclear reactors have increased only slightly since 1965, from a range of about 17 cents to 22 cents per million Btu, to about 30 cents in 1974. Present trends in reactor capital costs are significantly narrowing the economic advantage offered by fuel cycle costs, over coal and oil-fired plants.

B. ENVIRONMENTAL EFFECTS

Although nuclear plants do not emit particulates or gaseous pollutants from combustion, the potential for serious environmental problems exists. Some airborne and liquid radioactive materials are released to the environment during normal operation. The amounts released are very small and potential exposure has been shown to be less than the average level of natural radiation exposure. The plants are designed and operated in such a way that the probability of harmful radioactivity released from accidents is very low.

Nuclear plants use essentially the same cooling process as fossil-fuel plants and thus share the problem of heat dissipation from cooling water. However, light water reactors require larger amounts of cooling water and discharge greater amounts of waste heat to the water than comparably sized fossil-fuel plants. The effects of thermal discharges may be beneficial in some though not all cases. Adverse effects can often be mitigated by use of cooling towers.

Low level radioactive wastes from normal operation of a nuclear plant must be collected, placed in protective containers, and shipped to a Federally-licensed storage site. High level wastes created within the fuel elements remain there until the fuel element is processed. Currently, spent fuel is stored at NRC-licensed facilities. Plans call for recovering unused fuels at reprocessing plants, solidifying the wastes, and placing them in storage at a Federal Repository.

Primary residuals from light water reactors are waste heat and radioactive emissions. For a 1000 MW(e) plant operating at a 75 percent load factor, a 33 percent efficient nuclear plant would emit 47 x 10^{12} Btu's of waste heat annually. For comparison, a 40 percent efficient fossil fuel plant would emit 36 x 10^{12} Btu's of waste heat.

To substitute for this proposed sale, it would take one 1000 MW(e) light water reactors to supply the equivalent energy, assuming 40 percent plant efficiency and 80 percent loading. First core loading of this plant would require 30 tons of enriched uranium (U_3O_8), with annual reloadings requiring 10 tons. This kind of substitution assumes that all oil and gas produced from this sale would generate electricity. Nationally, only 8 percent of oil and 18 percent of gas consumed is utilized to generate energy.

There are also the impacts on land, water, and air quality arising from the mining of these uranium ores. Dwindling amounts of high grade reserves will increase the amounts of land mined for lower grade radioactive ores—primarily in western states. The mining operations will be similar to coal, but the nature and distribution of the deposits mean ''lesser'' impact while radioactive tailings cause unusual problems for disposal, the environment, and human health.

5. Oil Shale

A. DESCRIPTION

Large areas of the United States are known to contain oil shale deposits but those in the Green River formation in Colorado, Wyoming, and Utah, have the greatest commercial potential.

The oil shale resources of the Green River formation are estimated at 1,781 billion barrels, of which 129 billion barrels are classes one and two resources, 186 billion barrels are class three resources, and 1,466 billion barrels are class four resources (National Petroleum Council, 1972).

To substitute the energy equivalent estimated to be produced from this proposed sale, from 17.4 to 44.4 million tons of oil shale would have to be mined and processed, i.e., from 47,650 to 121,590 tons per day.

B. ENVIRONMENTAL EFFECTS

Oil shale development poses serious environmental problems. With surface or conventional underground mining, it is very difficult to dispose of the huge quantities of spent shale, which occupy a larger volume than before the oil was extracted. Inducing revegetation in an area of oil shale development is difficult and may take more than ten years. In-place processing avoids many of these environmental hazards. The spent shale problem is much less severe with underground mining.

Air pollutants from the mining will come from dust and vehicular traffic. These will be predominantly particulates, followed by NO_x and CO, with minimal amounts of hydrocarbons SO_x, and aldehydes.

The mining of oil shale requires little water, both for operations and for reclaiming solid wastes. Water pollutants are considered negligible but may arise if saline water were encountered during the operations and had to be disposed of.

However, the processing (retorting) operations consume large quantities of water and generate large amounts of waste water. The waste water must be treated and can be reused in the processes. Therefore, it has been assumed that water pollution will not be a problem outside the complex. However, the limited availability of input water in the development area could lead to resource use conflicts.

Air pollutants vary with the technology used. Solid waste comprises the greatest problem of oil shale processing. The volume of the waste is greater than the volume of the input. Therefore, backfilling and the like would not provide a sufficient disposal space. Finally, there are the impacts of access and of transporting the products. These are analogous to those of coal mining in the case of access, and petroleum distribution in the case of transporting the product.

6. Hydroelectric Power

A. DESCRIPTION

Hydropower is energy from falling water, which is used to drive turbines and thus produce electricity. Conventional hydroelectric developments convert the energy of natural regulated stream flows falling from a height to produce electric power. Pumped storage projects generate electric power by releasing water from an upper to a lower storage pool and then pumping the water back to the upper pool for repeated use. A pumped storage project consumes more energy than it generates but converts offpeak, low value energy to high value peak energy.

Many of the major hydroelectric sites operating today were developed in the early 1950's. Thirty to forty years ago hydroelectric plants supplied as much as 30 percent of the electricity produced in the U.S. Although hydroplant production has steadily increased, thermal-electric plant production has increased at a faster rate.

As of May 1974, total conventional hydropower developed in the contiguous U.S. was 54,885 MW, nearly one half of which was in the western states of Washington, Oregon, and California. Some 6878 MW of conventional hydro capacity are now being installed, about 90 percent of which is in the western part of the country.

Much of recent hydroelectric development has been pumped storage capacity. As of May 1974, the total developed pumped storage capacity in the contiguous U.S. was 8119 MW; capacity under construction was 6253 MW.

The undeveloped potential for hydroelectric generation is about 93,000 MW in the lower 48 states and about 32,000 MW in Alaska. However, it is likely that hydroelectric power will continue to represent a declining percentage of the total U.S. energy mix due to the following: high capital costs, seasonal variations in waterflows, land use conflicts, environmental effects, water use, and flood control constraints. Sites with the greatest production capacity and lowest development costs have already been exploited.

B. ENVIRONMENTAL EFFECTS

Construction of a hydroelectric dam represents an irreversible commitment of the land resource beneath the dam and lake. Flooding eliminates wildlife habitat and prevents other uses such as agriculture, mining, an free-flowing river recreation.

Hydroelectric projects do not consume fuel and do not cause air pollution. However, use of streams for power may displace recreational and other uses. Water released from reservoirs during summer months may change ambient water temperatures and lower the oxygen content of the river downstream, adversely affecting indigenous fish. Fluctuating reservoir releases during peak load operation may also adversely affect fisheries and downstream recreation. Screens placed over turbines prevent the entrance of fish, but small organisms may pass through and may be killed.

Fish may die from nitrogen supersaturation, which results at a dam when excess water escapes from the draining reservoir. High nitrogen levels in the Columbia and Snake Rivers pose a threat to the salmon and steelhead resources of these rivers. Other adverse impacts to water quality include possible saline water intrusion into waterways and decreased ability of the waters to accommodate waste discharges.

Air quality will only be affected by dust and emissions during the construction phase. Afterwards, if the impoundment is used for recreation, motor exhausts would occur.

Land, other than that inundated, would be disturbed by support facilities, roads and transmission line rights-of-way.

7. Solar Energy

A. DESCRIPTION

Applications of solar energy must take into account the following:

Solar energy is a diffuse, low intensity source.
Its intensity is continuously variable with time of day, weather, and season.
Its availability differs widely between geographic areas.

Potential applications of solar energy show a wide range. Among them are:

- Thermal energy for buildings
  - Water heating, space heating, space cooling combined systems
- Renewable clean fuel sources
  - Combustion of organic matter
  - Bioconversion of organic materials to methane
  - Pyrolysis of organic materials to gas, liquid, and solid fuels
  - Chemical reduction of organic materials to oil
- Electric power generation
  - Thermal conversion
  - Photovoltaic—residential/commercial, ground central station, space central station
  - Wind energy conversion
  - Ocean thermal difference

Because of the energy situation, congressional interest in solar energy research has intensified. The Solar Heating and Cooling Demonstration Act of 1974 legislates a $60 million demonstration program aimed at proving the commercial feasibility of solar heating of buildings and homes by 1977 and of combined solar heating and cooling systems for those constructed by 1979. A recent project in the Southwest U.S. has been approved for experiment by the Energy Research and Development Administration. Interest in this energy source in this region has intensified in the past couple of years with the increase in conventional space heating fuel costs, however, only a few individual efforts have been developed to-date.

B. ENVIRONMENTAL EFFECTS

Although fuel costs for backup systems and maintenance costs for solar units are small when compared with operating costs of conventional heating and cooling systems, the high initial or "fixed" costs of solar units make them unattractive to many homeowners and builders. The typical solar heating system for a home costs $5,000-$6,000 (including costs of a standby conventional furnace) compared to $1,000-$2,000 for a conventional fossil-fuel home heating unit. However, the rising cost of the gas and oil needed by the conventional heaters means that, over time, the greater fixed costs of solar systems will be balanced by their lack of fuel costs.

Larger-scale generation of electricity using solar energy is another promising application which is receiving funding. Authorization for $33 million for solar electric program was requested during fiscal 1975-almost $26 million more than the fiscal 1974 appropriation. A number of technical and engineering problems now prevent commercialization of solar steam-electric plants, though pilot projects are well underway. It is estimated that solar electricity will be available on a significant scale in 10 to 15 years or more.

Among the disadvantages of solar-electric-energy are high capital costs, expensive maintenance of solar collectors, thermal waste disposal, and distortion of local thermal balances.

The impacts so far identified with solar energy are relatively minimal. The primary effects of the use of this energy sources on a wide scale will be land use. Due to the low density of the energy, large areas will be necessary for the collectors. However, the land use compares favorably with other forms of energy use such as coal extraction.

The only other area for concern known so far is thermal pollution. Direct use in space heating has no thermal effects. However, for solar electric power generation, heat will have to be collected and transferred to the generator. Some localized thermal pollution may occur as a result, but the problem is not expected to be significant. Finally, solar plants can only operate intermittently. Thus, the energy will have to be either stored, or backup fossil plants will have to be built. These will have their own sets of environmental constraints.

8. Oil Imports

A. DESCRIPTION

U.S. reliance on imported oil has steadily increased in the last decade due to declining domestic production and increasing domestic demand. Future import availability is tenuous considering the 1973 Middle East cutback, the current Iranian oil situation, OPEC price hikes, Mexican supply prices and policies, and cutbacks from other Western Hemisphere suppliers.

The effect on the U.S. balance of payments is seen when comparisons are made between domestic and imported crude oil prices and quantities. In June 1978, the cost to refineries of imported crude was $14.54 per barrel versus the actual domestic average of $9.05. Imports of crude oil for the first 10 months of 1978 averaged 6.3 million barrels per day (MBPD) and domestic production averaged 8.7 MBPD. During 1977, the respective averages were 6.6 MBPD. The recent price hikes will push imported crude oil prices even higher and supplies will be lower because of Iran's lowered production. Some OPEC countries are considering the spot market for their production rather than the contract market and the cost of spot market oil is presently over $20.00 per barrel. Shortfalls between U.S. supply and demand would likely come from the spot market in the long term.

B. ENVIRONMENTAL EFFECTS

The primary hazard to the natural environment of increased oil imports is the possibility of oil spills, which can result from accidental discharge, intentional discharge, and tanker casualties. Intentional discharges would result largely from tank cleaning operations. The effects of chronic low-level pollution are largely unknown. The world-wide tanker casualty analysis indicates that, overall, an insignificant amount of the total volume of transported oil is spilled due to tanker accidents. However, a single incident such as the breakup of the Torrey Canyon can have disastrous results. However, it is probable that crude oil produced as a result of the proposed sale will be transported by U.S. flag ships or their equivalent, while imported oil may be transported via foreign tankers. Because U.S. flag ships have a better oil spill incident record than the world-wide tanker fleet average, tankering of OCS produced oil may result in less oil spillage due to accident and routine operations, than would imports of a similar volume of crude oil.

Of more concern though is the impact to the social and economic environment. The potential for a future embargo under this option is such that American productivity and policy could become subservient to foreign influence. Particularly sensitive would be the Gulf States oil and gas supply which already is somewhat dependent on foreign energy sources at the present time. Prices, products, and employment in the region may fluctuate, and fluctuate severely, because of international decisions beyond the control of Gulf States. On a more subtle level, political alignments and policies of the U.S. could become tied to those of foreign oil powers. This option is the least acceptable for continued American energy independence.

9. Natural Gas Imports

A. DESCRIPTION

Imports of natural gas via pipeline have come largely from Canada, with small amounts from Mexico. In 1973, net pipeline imports from Canada were 1,028 bcf, about 4.6 percent of total natural gas used in the U.S. These imports were about 33 percent of Canada's natural gas production. Natural gas pipeline imports from Mexico have not been a significant part of U.S. supply. In 1973, imports from Mexico were 1.6 bcf.

Mexico may become a significant source of future imports because of its natural gas resources. Imports from Mexico were of a local nature until 1957 and have declined since 1969. Canadian intentions to gradually phase out oil exports to the U.S. also puts into question increased natural gas pipeline exports.

Natural gas imports would have to be about 140 to 350 million cubic feet per day to replace the gas production estimated to be available from this proposed sale.

B. ENVIRONMENTAL EFFECTS

The environmental impacts of increasing gas imports derive mainly from the possible increased use of land for pipeline construction. A further impact is the risk of explosions and fires. As with imports of oil, the Gulf States could become dependent on foreign control of supply. Fluctuations of that supply could influence quality of life, productivity, and employment. American policies could also become influenced by decisions of foreign oil power, much as they could under the option of increasing oil imports.

10. Liquefied Natural Gas Imports

A. DESCRIPTION

The growing shortage of domestic natural gas has encouraged projects to import liquefied natural gas (LNG) under long-term contract. Large scale shipping of LNG is a relatively new industry. Several LNG projects are now under consideration on the Pacific, Atlantic, and Gulf coasts. Security of foreign LNG is questionable. The complexity of and length of time involved in implementing these proposals has been increased by the need for negotiating preliminary contracts, securing the approval of the Federal Energy Regulation Commission and the exporting country, and making adequate provision for environmental and safety concerns in the proposed U.S. facilities.

B. ENVIRONMENTAL EFFECTS

The environmental impacts of LNG imports arise from tankers; terminal, transfer, and regasification facilities; and transportation of gas. The primary hazard of handling LNG is the possibility of a fire or explosion during transportation, transfer, or storage.

Receiving and regasification facilities will require prime shoreline locations and dredging of channels. Regasification of LNG will release few pollutants to the air or water.

LNG imports will influence the U.S. balance of payments. This impact will depend on the origin and purchase price of the LNG, the source of the capital, and the country (U.S. or foreign) in which equipment is purchased and LNG tankers are built.

11. Geothermal Energy

A. DESCRIPTION

Geothermal energy is primarily heat energy from the interior of the earth. It may be generated by radioactive decay of elements such as uranium or thorium, and friction due to tidal or crustal place motions.

There are four major types of geothermal systems: hot water, vapor dominated, geopressured reservoirs, and hot dry rock systems.

In addition to electricity, geothermal energy can offer a potential for space heating, industrial processing, and other nonelectric uses in many areas which presently are highly dependent upon oil and gas for energy needs. However, geothermal electric generating plants are smaller than conventional plants and require a greater amount of steam to generate the same amount of energy. This is due to the fact that temperatures and pressures associated with geothermal areas are lower than those created at conventional power plants. In some areas, geothermal resources may have potential for space heating, industrial processing, and other non-electric uses.

The greatest potential for geothermal energy in the U.S. is found in the Rocky Mountain and Pacific regions; some potential exists in the Gulf Coastal Plain of Texas and Louisiana. The Geysers field in California is the most extensively developed source of geothermal energy in the U.S. It has been producing power since 1969. Exploration efforts are also underway in the Imperial Valley, Salton Sea, Mono Lake, and Modoc County, California.

Within 20 years, geothermal energy may account for about 1 to 2 percent of total U.S. energy and about 5 percent of California's energy consumption.

However, this energy source is not thought to be beneficial to the enegy need of this area. Large resources of this type are not known to be located in sites in close proximity to the Gulf States that would benefit from oil and gas resources that are anticipated from this proposed sale.

B. ENVIRONMENTAL EFFECTS

A number of gases are associated with geothermal systems and may pose health and pollution problems. These gases include ammonia, boric acid, carbon dioxide, carbon monoxide, hydrogen sulfide, and others. However, adverse air quality impacts are generally less than those associated with fossil-fuel plants. Also associated with geothermal energy systems are saline waters which must be disposed of and isolated from contact with ground water regimes.

Land quality problems stem from disturbance due to construction of related facilities, and possible ground subsidence which, in turn, can cause structural failures and loss of ground water storage capacity.

12. Other Energy Sources

The high cost and rapidly shrinking reserves of the traditional energy fuels have encouraged research into new and different sources for potential energy. Some of these alternate sources have been known for decades but high costs and technical problems have prevented their widespread use. They include tidal power, wind power, organic fuels and ocean thermal-gradients among others.

Environmental impacts of these alternatives are difficult to assess, especially as a great amount of research and development remains to be completed before operational scale systems can be developed, tested, and evaluated for production and application.

The date of commercial availability of such alternatives will depend on the cost of the traditional enegy fuels, the level of Federally subsidized research through ERDA assistance, and the solution of engineering and technical problems.

ENVIRONMENTAL EFFECTS

None of the direct environmental effects expected from the proposed sale would occur should the proposed sale be withdrawn. Further delay in the national goal of achieving energy independence would take place. The estimated 21.6-59.8 million barrels of oil and the 359.6-893.4 billion cubic feet of gas which would result from this sale would have to be supplied from other sources; the majority of it imported. Increased imports could have other adverse economic impacts.

The extensive petroleum refining industry in the Gulf of Mexico is an important component of the total national industry. In the event that oil production does not result from this proposed sale, due to withdrawal of the sale, it appears likely that crude oil imports will be utilized in place of this volume of domestic oil production. Since this foreign crude oil would be transported in tankers, oil spills originating from tanker operations could result. Furthermore, this increased tanker traffic could increase the possibility of collision of tankers with other shipping and existing fixed-structures, resulting in spilled oil, injuries and deaths.

Looking at another energy source, coal, over the longer term, the energy expected to be realized from this proposed sale could be eventually provided from coal. The acceleration of coal development to the point of replacing expected energy resources from the proposed OCS sale within a similar timeframe, however, would probably have a greater adverse impact on the general environment than the proposed action. Such impact would affect other sections of the U.S. and have environmental consequences of a different nature (land disruption, air pollution).

The substitution of energy resulting from the proposed sale by other sources such as oil shale, hydroelectric power, geothermal energy, solar energy and other energy sources is beyond our technological capabilities at the present time because they could not take place in the time frame which would make this substitution realistic. Much research is being done in these fields, and in the future greater dependence on them may be feasible.

In summary, the major environmental effects of the proposal would be entirely avoided. Withdrawal of this sale would, however, further intensify the problem of importation by tanker which would further increase the chance of collision and tanker accident in the Gulf of Mexico region with greater potential environmental effects, as well as have an adverse economic impact.

C. Delay the Sale

The sale could be delayed for a period of time sufficient to develop new environmental protection equipment, the completion of studies in the Gulf of Mexico concerning potential environmental impacts of offshore mineral development, the development of coastal zone plans, or the development of other legislation.

In the event that this option is selected, all of the environmental effects that are discussed in this impact statement would be postponed during the delay time.

ENVIRONMENTAL EFFECTS

Requirements of refineries in the Gulf of Mexico for crude oil would probably be met by a minor increase in imported crude oil. The delay in natural gas production would probably cause increased volumes of natural gas to be imported. A delay in holding the sale might cause losses of employment in the offshore activity related to exploration, production, and transportation of crude oil and natural gas, but the availability of imports should permit the processing, manufacture, and transportation of petroleum products derived from imported crude to continue. Unemployment effects due to shortages of natural gas are more difficult to determine, but would more likely have their major effect at points further from the Gulf of Mexico.

Section IX

Consultation And Coordination

A. Preparation of the Draft Environmental Statement

1. Federal Agencies

The following Federal agencies were contacted during the preparation of this statement:

Department of Agriculture
- Forest Service
- Soil Conservation Service

Department of Commerce
- National Oceanic and Atmospheric Administration
  - Office of Ocean Management
  - Office of Coastal Zone Management
  - National Weather Service
  - National Hurricane Center
  - National Ocean Survey
  - National Marine Fisheries Service
- National Technical Information Service
- Bureau of the Census
- Bureau of Economic Analysis

Department of Defense
Department of the Air Force
Department of the Army
- Corps of Engineers

Department of the Navy
- Oceanographer of the Navy

Department of Energy
- Energy Information Administration
- Federal Energy Regulatory Commission

Department of the Interior
- Office of the Solicitor
- Fish and Wildlife Service
- National Park Service
- Bureau of Mines
- Geological Survey
- Heritage Conservation and Recreation Service

Department of State

Department of Transportation
- Coast Guard
- Federal Aviation Administration
- Materials Transportation Bureau

Department of the Treasury

Environmental Protection Agency

Nuclear Regulatory Commission

Advisory Council on Historic Preservation

Marine Mammal Commission

Gulf Regional Fishery Management Council

2. Consultation Under Section 7 of the Endangered Species Act

Formal consultation under Section 7 of the Endangered Species Act was held with the Fish and Wildlife and National Marine Fisheries Services on April 4-6, 1978, for Proposed Sale 58. A request by BLM for a regional Gulf of Mexico endangered species consultation has been submitted to FWS and NMFS for their consideration. In the interim, the biological opinions for Proposed Sale 58 will be used for Proposed Sale 58A, since the same species and region are involved.

3. Coordination Meeting

In accordance with Department of the Interior Secretarial Order 2974, a meeting was held in New Orleans on April 11, 1978 to consider stipulations for this proposed sale. Representatives of the Bureau, Geological Survey, Fish and Wildlife Service and the State of Alabama, Mississippi, Louisiana and Texas reviewed the proposed stipulations and recommended modifications. Proposals for the environmental studies program were also discussed.

4. State and Local Agencies

The following state and local government agencies were contacted during the preparation of this statement:

Alabama
- Office of the Governor
- Development Office
  - State Clearinghouse
- Department of Conservation and Natural Resources
  - Geological Survey
- Historical Commission
  - State Historical Preservation Officer
- Coastal Area Board
- South Alabama Regional Planning Commission

Louisiana
- Office of the Governor
- Department of Urban and Community Affairs
  - State Clearinghouse
- Department of Natural Resources
- Department of Culture, Recreation and Tourism
  - State Historic Preservation Officer
- Department of Wildlife and Fisheries
- Department of Transportation and Development
- Council on Environmental Quality
- Regional Planning Commission for Jefferson, Orleans, and St. Bernard Parishes
- Acadiana Regional Clearinghouse
- Southwest Regional Clearinghouse
- Teche Regional Clearinghouse
- Metropolitan Regional Clearinghouse

Mississippi
- Office of the Governor
  - State Clearinghouse
- Marine Resources Council
- Department of Archives and History
  - State Historic Preservation Officer

- Natural Heritage Program
- Gulf Regional Planning Commission
- South Mississippi Planning and Development District

Texas

- Office of the Governor
    - Budget and Planning
    - State Clearinghouse
- Historical Commission
    - State Historic Preservation Officer
    - Antiquities Committee
- General Land Office
- Southeast Texas Regional Planning Commission
- Lower Rio Grande Valley Development Council
- Coastal Bend Council of Governments
- Houston-Galveston Area Council
- Golden Crescent Council of Governments

5. Consultation with State Historic Preservation Officers

In compliance with regulations issued by the Advisory Council on Historic Preservation, the State Historic Preservation Officers (SHPO's) in the Gulf states bordering this sale have been contacted at several stages during the planning process. Prior to the issuance of the draft environmental statement the SHPO's were asked to identify important historical, archaeological or cultural resources which they felt might be affected by oil and gas leasing and development on the outer continental shelf. After the draft environmental statement was published the SHPO's were asked to comment on the proposal and the draft statement. The comments received and our responses to those comments follow.

6. Review of the Preliminary Draft Environmental Statement

The states of Alabama, Mississippi, Louisiana and Texas were invited to review the preliminary draft of this statement.

B. Review of the Draft Environmental Statement

1. Copies of the draft environmental statement were sent to the following agencies and groups for review:

Federal Agencies:

Department of Commerce

- National Oceanic and Atmospheric Administration

Department of Defense

Department of the Air Force

Department of the Army

Department of the Navy

Department of Energy

- Federal Energy Regulatory Commission

Department of Health, Education, and Welfare

Department of Housing and Urban Development

Department of the Interior

- Office of the Solicitor
- Fish and Wildlife Service
- National Park Service
- Heritage Conservation and Recreation Service
- Bureau of Mines
- Geological Survey
- Department of Justice
- Department of State
- Department of Transportation
    - Coast Guard
    - Federal Aviation Administration
    - Materials Transportation Bureau
- Environmental Protection Agency
- Federal Communications Commission
- Federal Maritime Commission
- Federal Trade Commission
- Interstate Commerce Commission
- National Science Foundation
- National Transportation Safety Board
- Nuclear Regulatory Commission
- Advisory Council on Historic Preservation
- Marine Mammal Commission
- Gulf Regional Fishery Management Council
- Water Resources Council

State Agencies:

Alabama

- Development Office
    - State Clearinghouse
- Department of Conservation and Natural Resources
    - Geological Survey
- Historical Commission
    - State Historic Preservation Officer
- Coastal Area Board

Louisiana

- Department of Urban and Community Affairs
    - State Clearinghouse
- Department of Culture, Recreation and Tourism
    - State Historic Preservation Officer
- Department of Natural Resources
- Department of Wildlife and Fisheries
- Department of Transportation and Development
- Council on Environmental Quality

Mississippi

- Office of the Governor
    - State Clearinghouse
- Department of Archives and History
    - State Historic Preservation Officer
- Natural Heritage Program
    - Marine Resources Council

Texas

- Office of the Governor
    - State Clearinghouse
    - Budget and Planning
- Historical Commission
    - State Historic Preservation Officer
    - Antiquities Committee

Areawide Clearinghouses:

Alabama

- South Alabama Regional Planning Commission

Louisiana

State of Louisiana
Department of Culture, Recreation and Tourism
Office of Program Development

EDWIN EDWARDS
GOVERNOR
SANDRA S. THOMPSON
SECRETARY
E. BERNARD CARRIER, PH.D.
ASSISTANT SECRETARY

DIVISIONS
OUTDOOR RECREATION
(504) 389-5000
HISTORIC PRESERVATION
(504) 389-5008
ARCHAEOLOGY
(504) 389-6781
ARTS
(504) 389-6201

June 29, 1978

Mr. Douglas J. Elvers
Bureau of Land Management
500 Camp Street, Suite 841
New Orleans, Louisiana 70130

Re: Environmental Statements
OCS Oil and Gas Lease Sales
Numbers 58 and 58A

Dear Mr. Elvers:

Thank you for sending the environmental information for the above referenced OCS lease sales. I have no objection to the sections pertaining to the potential impact on cultural resources. I note, however, that a cultural resources survey is recommended for those blocks which fall in Zones 1 and 2 as described in the National Park Service publication, Cultural Resources Evaluation of the Northern Gulf of Mexico Continental Shelf (see Volume III).

In answer to your question posed in your letter of June 15, 1978, I prefer to review the officially published draft.

If you have any questions or if I may be of further assistance, please do not hesitate to contact my staff at the State Archaeologist's Office at (504)389-6751.

Sincerely yours,

E. Bernard Carrier

E. Bernard Carrier
State Historic Preservation Officer

EBC:LL:mp

NEW ORLEANS OCS
FILE CODE ______
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___ ASST. MGR. ______
JUL 3 1978
___ P. LEGAL ______
___ FAO ______
___ EAD ______
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___ STUDIES ______
___ MGMT. SER. ______

STATE OF MISSISSIPPI
DEPARTMENT OF ARCHIVES AND HISTORY
P. O. BOX 571
JACKSON, MISSISSIPPI 39205

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DIRECTOR

June 29, 1978

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JUN 30 1978
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___ STUDIES ______
___ MGMT. SER. ______ Sale 58A File,

Mr. Douglas J. Elvers
Bureau of Land Management
New Orleans Outer Continental Shelf Office
Hale Boggs Federal Building
500 Camp Street, Suite 841
New Orleans, Louisiana 70130

Re: Oil and Gas Lease Sale #58A

Dear Mr. Elvers:

Thank you for your correspondence of June 15, 1978. The above mentioned lease will not affect Mississippi coastal waters, and therefore we have no further comment.

Sincerely,

ELBERT R. HILLIARD
State Historic Preservation Officer

Paul Newsom

By: Paul Newsom
Environmental Coordinator

PN/dm

58A

TEXAS HISTORICAL COMMISSION

TRUETT LATIMER
EXECUTIVE DIRECTOR

P. O. BOX 12276
AUSTIN TEXAS 78711

June 27, 1978

Mr. Douglas J. Elvers, Acting Manager
U.S. Department of the Interior
Bureau of Land Management
500 Camp Street, Suite 841
New Orleans, LA 70130

RE: 1792 (300)
Sale 58A

Dear Mr. Elvers:

Thank you for your letter of June 15, 1978. I feel you are correct regarding letting our comments for sale 51 stand for sale 58A since the situation is essentially unchanged.

Your request that we review the pre-draft by referring to the previous draft environmental statement also seems reasonable.

Your cooperation with us in these matters is appreciated.

Sincerely,

Truett Latimer

Truett Latimer
Executive Director

TL/BA/jl

MGR.
ASST. MGR.
JUN [illegible] 1978
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✓ FAO
STUDIES
MGMT. SER.

The State Agency for Historic Preservation

Texas Antiquities Committee
Box 12276, Capitol Station, Austin, Texas 78711

DR. FRED WENDORF
Chairman
TRUETT LATIMER
Executive Secretary
BOB ARMSTRONG
HENRY B. BURKETT
DR. W. C. HOLDEN
DR. W. W. NEWCOMB
CURTIS TUNNELL

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62

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BUREAU OF LAND MGMT.
OUTER CONTINENTAL
SHELF OFFICE
NEW ORLEANS, LA.

May 24, 1978

Mr. John L. Rankin, Manager
New Orleans OCS Office
Hale Boggs Federal Building
500 Camp Street, Suite 841
New Orleans, LA 70130

RE: 6411 (300)

Dear Mr. Rankin:

Mr. Truett Latimer forwarded your letter of May 17, 1978 to me for reply. Enclosed please find a list of the coastal counties of Texas with the number of pre-twentieth century shipwrecks listed.

This information is extracted from the Texas Antiquities Committee's shipwreck reference file.

If we can be of further assistance please let us know.

Sincerely,

J. Barto Arnold III

J. Barto Arnold III
State Marine Archeologist

JBA/jl

Enclosure

Regional Planning Commission for Jefferson, Orleans, and St. Bernard Parishes

Acadiana Regional Clearinghouse
Southwest Regional Clearinghouse
Teche Regional Clearinghouse
Metropolitan Regional Clearinghouse

Mississippi

Gulf Regional Planning Commission
South Mississippi Planning and Development District

Texas

Southeast Texas Regional Planning Commission
Lower Rio Grande Valley Development Council
Coastal Bend Council of Governors
Houston-Galveston Area Council
Golden Crescent Council of Governments

Public Interest Groups:

Alabama

The Alabama Conservancy
Alabama Ornithological Society
Envirosouth, Inc.
League of Women Voters of Alabama
Mobile Bay Audubon Society
Southeastern Herpetological Society
Alabama Wildlife Federation
Alabama Environmental Quality Association
Sierra Club

District of Columbia

Chamber of Commerce of the United States
Conservation Foundation
Environmental Policy Center
Izaak Walton League of America
Monitor
National Audubon Society
National Wildlife Federation
Natural Resources Defense Council
Sierra Club
Wilderness Society
World Wildlife Fund
American Fisheries Society
Marine Technological Society
Sport Fishing Institute
Environmental Defense Fund
National Ocean Industries Association
National Parks and Conservation Association
National Recreation and Park Association
National Waterways Conference
Water Resources Congress
Whale Protection Fund
The Fund for Animals
Environmental Land Institute
League of Women Voters
Environmental Action, Inc.
National Clean Air Coalition
Public Interest Research Group
National Energy Resources Organization
Rand Corporation
SRI International
Independent Petroleum Association of America
Natural Gas Supply Committee
Oil, Chemical and Atomic Workers International Union, AFL-CIO
American Petroleum Refiners Association
Independent Refiners Association of America
National Petroleum Refiners Association
Association of Oil Pipe Lines
American Gas Association Library
American Petroleum Institute
Americans for Energy Independence
Energy Policy Task Force of Consumer Federation of America
Interstate Natural Gas Association of America
Brookings Institution
American Chemical Society
Wildlife Management Institute
Concern, Inc.
Rachel Carson Trust for the Living Environment, Inc.
American Council on the Environment
American Lung Association
National Trust for Historic Preservation

Louisiana

Louisiana Wildlife Federation, Inc.
Ecology Center of Louisiana
Coastal Environments, Inc.
Atchafalaya Information Bureau
Audubon Society
Fund for Animals, Inc.
League of Women Voters of Louisiana
Louisiana Environmental Professionals Association
Louisiana Environmental Society, Inc.
Louisiana Nature Center
Louisiana Wildlife Biologists Association
Save Our Wetlands
Sierra Club

Mississippi

Citizens for Leaving the Environment of America Natural (CLEAN)
Mississippi League of Women Voters
Mississippi Coast Audubon Society
Mississippi Conservation Council
Mississippi Ornithological Society
Mississippi Wildlife Federation
Save the Bay, Inc.
Sierra Club
Southeastern Fishes Council
Wildlife Society
Nature Conservancy

Texas

Sportsmen's Club of Texas, Inc.
Texas Committee on Natural Resources
Texas Conservation Council, Inc.
Wildlife Society
National Audubon Society
Welder Wildlife Foundation
Sierra Club
American Lung Association of Texas
Bayou Preservation Association, Inc.
Citizens Environmental Coalition
Citizens Who Care
Coastal Bend Conservation Association
Common Cause
Clean Air and Water
Environmental Concern
Ecology Action
Houston Solar Energy Society
League of Women Voters of Texas
Southeast Texas Resources
Texas Bay and Gulf Fishermen's Association
Texas Environmental Coalition
Wildlands Preservation Society

NOTE: Comments have been received and are attached.

2. Public Hearing

A public Hearing was held in New Orleans, Louisiana, on March 6, 1979. A panel of officials from the U.S. Department of the Interior, Bureau of Land Management, Geological Survey, and Fish and Wildlife Service was formed to receive the testimony. No one testified at the hearing.

An official transcript of the hearing is available for public inspection at the Bureau of Land Management, Outer Continental Shelf Office, New Orleans, Louisiana, and Bureau headquarters in Washington, D.C.

C. Summary of Correspondence Received Following Review of the Draft Environmental Statement

A total of 34 letters were received commenting on the draft statement. This included correspondence from 16 Federal agencies, 11 state agencies, three areawide clearinghouses, two corporations, one public interest group, and one individual. All correspondence received by March 20, 1979 is reproduced.

Comments are numbered in consecutive order on each letter. The numbered responses on the pages immediately following each letter correspond to these numbers. To facilitate this referral system, the letters are organized alphabetically in the following categories: Federal agencies, state agencies, areawide clearinghouses, corporations, public interest groups, and individuals.

D. Summary of Changes from the Draft Environmental Statement

Minor editorial and factual changes have been incorporated into this statement without acknowledgment in this section. Some important additions or deletions were made in response to comments received on the DES or in support of the new CEQ guidelines on the National Environmental Policy Act encouraging briefer documents. For example, relevant portions of the Appendices have been incorporated into the text and other Appendices have been either completely eliminated because they did not directly relate to this proposal or else they were published in former environmental statements and are considered part of this FES by reference.

E. Correspondence Received

Federal Agencies:

P. O. BOX 12276
AUSTIN TEXAS 78711

TEXAS HISTORICAL COMMISSION

TRUETT LATIMER
EXECUTIVE DIRECTOR

January 30, 1979

Mr. John L. Rankin, Manager
U.S. Dept of Interior, BLM
OCS Office
500 Camp Street, Suite 841
New Orleans, Louisiana 70130

RE: Sale 58A

Dear Mr. Rankin:

Regarding the Environmental Statement for Sale 58A we offer the following observations. On page 156 it is stated that "No underwater archaeological sites have been identified and verified offshore..." This statement may be true for the OCS, but such sites have been located in state waters at least including one in Texas and several in Florida. There may be more of which I am not presently aware. 1.

On page 196 it is said that "Remote sensing geophysical surveys with professional archaeological interpretation are not 100% effective." We feel that you should go on to say that this is principally due to the fact that the survey vessel lane spacing required by USGS for these surveys is much too wide. This brings us to our third point. It is now almost two years since the Reston meeting at which improvements to Notice No. 75-3 regarding the parameters for these surveys was discussed. When can we expect some action in this area? 2.

Thank you for the opportunity to review this document.

Sincerely,

Truett Latimer
State Historic Preservation Officer

By J. Barto Arnold III

J. Barto Arnold III
Marine Archeologist

JBA/jl

NEW ORLEANS OCS
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RESPONSE TO COMMENTS BY THE TEXAS HISTORICAL COMMISSION

1. The text was changed to read "No underwater archaeological sites have been identified and verified on the OCS,...".

2. The Notice to Lessees and Operators No. 75-3 has not been revised since January 20, 1975. However, an interagency review committee has been charged with developing national standards for marine surveys to protect cultural resources. The special study "Cultural Resources Evaluation of the Northern Gulf of Mexico Continental Shelf" also concludes the 150-meter lane spacing is insufficient for a comprehensive survey and recommends 50-meter lane spacing. It is hoped that the committee will recommend standards that can be incorporated into an appropriate Notice to Lessees by the U.S. Geological Survey.

STATE OF ALABAMA
ALABAMA HISTORICAL COMMISSION
725 MONROE STREET
MONTGOMERY, ALABAMA 36104

A. RUSSELL MORTENSEN
EXECUTIVE DIRECTOR

TELEPHONE NUMBER
832-6621

February 14, 1979

Mr. John L. Rankin
Manager
U. S. Department of the
Interior
Bureau of Land Management
500 Camp Street, Suite 841
New Orleans, Louisiana 70130

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RE: Draft Environmental Impact
Statement prepared by the
Bureua of Land Management for
the Proposed 1979 Outer Continental
Shelf Oil and Gas Lease Sale 58A
Western and Central Gulf of Mexico

Dear Mr. Rankin:

The Bureau of Land Management is to be commended for the consideration and protection it is affording cultural resources in its draft EIS for the above mentioned project. However, it is the recommendation of the State Historic Preservation Officer that each parcel of land to be leased shall be subjected to a remote sensing survey rather than just areas suspected of containing significant cultural resources. 1.

If you have any questions or comments, or if my staff can assist you in any way, please feel free to contact this office.

Sincerely,

Milo B. Howard, Jr.
Milo B. Howard, Jr.
State Historic Preservation Officer

MBH,Jr./djd

Attachment

RESPONSE TO COMMENTS BY THE ALABAMA HISTORICAL COMMISSION

1. A (MOU) between the U.S. Geological Survey and the Bureau of Land Management, entitled "Protection of Cultural Resources Related to Marine Oil and Gas Operations" was signed in March, 1978. This agreement states that USGS will implement the provisions of this stipulation whenever BLM or other informed sources provide documentation that a cultural resource may exist on a lease and the nature of the resource is such that it can be detected by means of a remote sensing survey. Appropriate documentation may include probablistic studies and archival research. The NPS, USGS, and BLM have agreed that the baseline study done in 1977 by Coastal Environments, Inc. entitled "Cultural Resources Evaluation of the Northern Gulf of Mexico Continental Shelf" would be the official basis for requiring cultural resource surveys in the Gulf of Mexico. This study established five zones of varying probability of the occurrence of cultural resources including shipwrecks and prehistoric human habitation sites. The first two zones were combined to form the currently accepted high probability-low probability demarcation line. Zone 1, closest to shore, has a high probability for shipwrecks and prehistoric habitation sites. Zone 2 has a low probability of shipwrecks, but Paleo-Indian habitation sites can occur there. The three zones deleted from the high probability area all have a low probability of shipwrecks and human habitation sites. In blocks where a shipwreck has been reported below the high probability zone, BLM recommends invocation of the stipulation.

UNITED STATES DEPARTMENT OF COMMERCE
Maritime Administration
Central Region Office
No. 2 Canal Street
New Orleans, La. 70130

NEW ORLEANS OCS
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March 8, 1979

Mr. John L. Rankin
Manager
U. S. Department of the
Interior
Bureau of Land Management
Hale Boggs Federal Building
Suite 841
500 Camp St.
New Orleans, LA 70130

Dear Mr. Rankin:

Receipt is acknowledged of your letter of January 26, 1979, regarding the draft environmental statement for the proposed Central and Western Gulf of Mexico Outer Continental Shelf Oil and Gas Lease Sale 58A.

We have carefully reviewed the draft environmental document and find no objection to it on matters of environmental concern to our agency.

Sincerely,

F. X. McNERNEY
Central Region Director

cc:
M-746 (Christie)

DEPARTMENT OF THE AIR FORCE
REGIONAL CIVIL ENGINEER - CENTRAL REGION (AFESC)
MAIN TOWER BUILDING
1200 MAIN STREET
DALLAS, TEXAS 75202

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

REPLY TO ATTN OF: ROV

13 February 1979

SUBJECT: Environmental Statement on Proposed 1979 Outer Continental Shelf Oil and Gas Lease Sale 58A

TO: Mr. John L. Rankin, Manager
US Department of the Interior
Bureau of Land Management
500 Camp Street, Suite 841
New Orleans, Louisiana 70130

1. Thank you for the opportunity to review the subject document. There will be no impact from this action on Air Force installations. Therefore, we have no comments.

2. As requested, we are attaching the form expressing our continued interest. We would appreciate remaining on your mailing list.

Stanley A. Bohinc
STANLEY A. BOHINC, Lt Col, USAF
Chief, Environmental Planning Div.

1 Atch
Interest Statement

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DEPARTMENT OF THE AIR FORCE
REGIONAL CIVIL ENGINEER, EASTERN REGION (HQ AFESC)
526 TITLE BUILDING, 30 PRYOR STREET, S.W.
ATLANTA, GEORGIA 30303

REPLY TO ATTN OF: ROV3

22 February 1979

SUBJECT: Draft EIS for Proposed 1979 Outer Continental Shelf Oil and Gas Lease Sale 58A

TO: U.S. Department of the Interior
Bureau of Land Management
Manager, New Orleans Outer Continental
Shelf Office
Suite 841, Hale Boggs Federal Bldg.
500 Camp Street
New Orleans LA 70130

1. We have completed our review of the subject draft EIS, and do not feel that the proposed action will have an impact on Air Force activities at this time.

2. Thank you for the opportunity to review this proposal. Please contact us if we can be of further assistance.

Ronald H Waters
RONALD H. WATERS
Lt. Col., USAF
Deputy Regional Civil Engineer

Cy to: ATC/DEV
3380 CES/DEEV

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON, D.C.
22304

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

20 MAR 1979

John L. Rankin
Manager
U.S. Department of the Interior
Bureau of Land Management
500 Camp Street, Suite 841
New Orleans, Louisiana 70130

Dear Mr. Rankin

This is in reply to your request for Air Force review and comment on the Draft Environment Statement for the 1979 Outer Continental Shelf Oil and Gas lease sale 58 A.

We request that any civil air traffic resulting from the above proposed action be coordinated with the Air Force. Such coordination will aid in providing separation between military and civil aircraft and will also reduce the number of unknown targets appearing on the defense radar which often result in unnecessary defense reactions.

Thank you for the opportunity to comment on the Draft EIS.

Sincerely

Hisao Yamada

HISAO YAMADA, Colonel, USAF
Chief, Environmental Planning Division
Directorate of Engineering & Services

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RESPONSE TO COMMENTS BY THE DEPARTMENT OF THE AIR FORCE, WASHINGTON, D.C.

Civil air traffic in connection with oil and gas activities on the OCS is regulated by other Federal agencies, including USGS and FAA. Established procedures should serve to minimize conflict between civilian and military aircraft.

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P. O. BOX 60267
NEW ORLEANS, LOUISIANA 70160

IN REPLY REFER TO
LMNPD-RE

16 March 1979

Manager
New Orleans OCS Office
Bureau of Land Management
Hale Boggs Federal Building
Suite 841
500 Camp Street
New Orleans, Louisiana 70130

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MAR 20 1979
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Dear Sir:

Your draft environmental impact statement (EIS), with cover letter dated 23 January 1979, concerning a proposed Outer Continental Shelf oil and gas lease sale in the western and central Gulf of Mexico (OCS Sale #58A) was referred to the New Orleans and Galveston Districts from our Washington office for review comments. This is a coordinated reply.

We have reviewed the draft EIS in accordance with our areas of responsibility and expertise as outlined in the Council on Environmental Quality guidelines, Title 40, CFR, Part 1500, published in the "Federal Register" dated 1 August 1973; and US Army Corps of Engineers administrative procedures for permit activities in navigable waters or ocean waters, Title 33, CFR, Parts 320-329, published in the "Federal Register" dated 19 July 1977.

We offer the following comments regarding the draft EIS:

a. Your office should contact Mr. Marcos De La Rosa, Chief, Permit Branch, U.S. Army Engineer District, Galveston, P.O. Box 1229, Galveston, Texas 77553, for a determination as to the necessity for Department of the Army permits.

b. Page 40, column 1, 1st paragraph, "68 cm (126.6 inches) of mercury" should be corrected to read "68 cm (26.6 inches) of mercury".

c. Page 15, column 2, 2nd paragraph, should state that the status of the Texas Coastal Zone Management plan is uncertain because of the ex-governor's failure to act on the proposal submitted to him. The new governor has requested a time extension from the Department of Commerce.

d. Page 83, 1st column, 2nd paragraph, Port Lavaca is not a deep water port and should be excluded from the list.

e. Page 83, 2nd column, 6th paragraph, should be revised to state that the Texas Deepwater Port Authority has taken over the Seadock project. The statement referring to a liquified natural gas (LNG) import terminal in Matagorda Bay should state that the Department of Energy has denied the project sponsor a permit to import LNG.

f. Page 84, 2nd column, 3rd paragraph, the dimensions of the Houston Ship Channel should be given since dimensions are given for other projects.

g. Page 85, 1st column, paragraphs 1,4, and 6, the dimensions of the Freeport, Corpus Christi, and Brownsville projects should also be given.

h. Page 85. 1st column, paragraph 3, lists Port O'Connor with deep water ports on the Texas Coast. Port O'Connor is a shallow water port and should be excluded from this list. In its place, the Matagorda Ship Channel (Point Comfort) should be included.

i. We suggest that the following differences between the summary (table E-2) and detailed (table E-3) environmental matrix analysis content of appendix E be resolved:

(1) Tracts 97 and 98 are identified as having maximum potential for impacts on littoral systems in table E-3. They have been omitted from the littoral systems summary of table E-2. The total set forth in table E-2 could accommodate these additions without change.

(2) Tracts 8, 10, 11, and 12 are identified as not having maximum potential for impacts on commercial fishing in table E-3. They have been included in the commercial fishing summary of table E-2. The total set forth in table E-2 could require reduction.

(3) Tract 27 is identified as not having maximum potential for impacts on shipping in table E-3. It has been included in the shipping summary of table E-2. The total set forth in table E-2 could require reduction.

Thank you for the opportunity to review and comment on this draft EIS.

Sincerely yours,

Charles E Deweese
CHARLES E. DEWEESE
LTC, CE
Deputy District Engineer

Copy furnished:

Environmental Protection Agency
Room 537, West Tower
401 M Street, SW, Mail Code A-104
Washington, DC 70460

Director (732)
Bureau of Land Management
Washington, DC 20240

RESPONSE TO COMMENTS BY THE DEPARTMENT OF THE ARMY, CORPS OF ENGINEERS

a. Prior to construction on the OCS, lessees are required to contact the appropriate U.S. Army Engineer District for permits.

b. text corrected.

c. not appropriate.

d. text corrected.

e. text corrected and revised.

f. text revised.

g. text revised.

h. text revised.

i. text revised.

DEPARTMENT OF THE NAVY
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20350

1 March 1979

Mr. John L. Rankin
Manager, New Orleans Outer
Continental Shelf Office
Suite 841, Hale Boggs Federal Bldg.
500 Camp Street
New Orleans, Louisiana 70130

Dear Mr. Rankin,

This letter is in response to your letter of January 26, 1979 requesting comments on the Draft Environmental Impact Statement (DEIS) for the proposed OCS Lease Sale No. 58A.

The statement has been reviewed and is generally concurred in. The attached enclosure contains specific comments regarding the DEIS.

Sincerely,

Mitzi M. Wertheim

MITZI M. WERTHEIM
Deputy Under Secretary

Copy to:
Deputy Assistant Secretary of Defense (Energy, Environment and Safety)
Bureau of Land Management (Code 722), Department of Interior

NEW ORLEANS OCS
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DRAFT ENVIRONMENTAL IMPACT STATEMENT, OUTER CONTINENTAL SHELF LEASE SALE NO. 58A, DEPARTMENT OF THE NAVY COMMENTS CONCERNING

1. Page 89, Section II.C.1.g - Military uses of the Continental Shelf. (sentence beginning on line 7)

Comment. Expand sentence to read; "Pilot training including air-to-air gunnery, carrier operations and mine research activities are conducted by the Department of the Navy. 1.

Reason. More adequately describes U.S. Navy operations in the Gulf of Mexico.

2. Page 151, Section III.D.1.a - Impact on Military Uses of the Continental Shelf. (first paragraph, line 10)

Comments: Insert sentence to read; "Nine tracts offered for this proposed sale are within the Navy's Corpus Christi Operating Area (w-228). Depending on the density of permanent drilling structures within the operating area, there may be use conflicts with the Navy's offshore air-to-air gunnery ranges and carrier operating areas." 2.

Reason: The accumulation of leased tracts in the ongoing series of OCS sales within the Corpus Christi Operating Area has the real potential for serious adverse impact on Navy activities.

3. Page 186, Section IV.D.7 - Special Stipulations.

Comments: Proposed lease tracts 1-6 and 8-10 lie within the Navy's Corpus Christi Operating Area. Stipulations covering indemnification and joint use similar to those contained in OCS Sale No. 65 (attached) should be applied to these tracts. 3.

Reason: To provide for the prerequisite coordination and safety of joint use between Industry's exploration/exploitation activity and Navy operations.

STIPULATION NO. 4

a. To apply only to the leases resulting from this proposed sale for tracts 58A-1 through 58A-6 and 58A-8 through 58A-10.

Whether or not compensation for such damage or injury might be due under a theory of strict or absolute liability or otherwise, the lessee assumes all risks of damage or injury to persons or property, which occur in, on, or above the Outer Continental Shelf, to any persons or to any property of any person or persons who are agents, employees or invitees of the lessee, its agents, independent contractors or subcontractors doing business with the lessee in connection with any activities being performed by the lessee in, on, or above the Outer Continental Shelf, if such injury or damage to such person or property occurs by reason of the activities of any agency of the U.S. Government, its contractors or subcontractors, or any of their officers, agents or employees, being conducted as a part of, or in connection with the programs and activities of the Naval Air Training Command, Naval Air Station, Corpus Christi, Texas. The lessee assumes this risk whether such injury or damage is caused in whole or in part by any act or omission, regardless of negligence or fault, of the United States, its contractors or subcontractors, or any of their officers, agents, or employees. The lessee further agrees to indemnify and save harmless the United States against and to defend at its own expense the United States against all claims for loss, damage, or injury sustained by the lessee, and to indemnify and save harmless the United States against, and to defend at its own expense the United States against all claims for loss, damage, or injury sustained by the agents, employees, or invitees of the lessee, its agents, or any independent contractors or subcontarctors doing business with the lessee in connection with the programs and activities of the aforementioned military installations, whether the same be caused in whole or in part by the negligence or fault of the United States, its contractors, or subcontarctors, or any of their officers, agents, or employees and whether such claims might be sustained under theories of strict or absolute liability or otherwise.

The lessee agrees to control his own electromagnetic emissions and those of his agents, employees, invitees, independent contractors or subcontractors emanating from individual designated defense warning areas in accordance with requirements specified by the commander of the appropriate onshore military installation, i.e. Naval Air Training Command, Naval Air Station Corpus Christi, Texas to the degree necessary to prevent damage to, or unacceptable interference with, Department of Defense flight, testing, or operations activities, conducted within individual designated warning areas. Necessary monitoring control, and coordination with the lessee, his agents, employees, invitees, independent contractors or subcontractors, will be effected by the commander of the appropriate onshore military installation conducting operations in the particular warning area. Provided, however, that control of such electromagnetic emissions shall in no instance prohibit all manner of electromagnetic communication during any period of time between a lessee, its agents, employees, invitees, independent contractors or subcontractors and onshore facilities.

The lessee, when operating or causing to be oeprated on its behalf boat or aircraft traffic into the individual designated warning areas shall enter into an agreement with the commander of the appropriate onshore military installation, i.e. Naval Air Training Command, Naval Air Station, Corpus Christi, Texas utilizing an individual designated warning area prior to commencing such traffic. Such agreement will provide for positive control of boats and aircraft operating into the warning area at all times.

RESPONSE TO COMMENTS BY THE DEPARTMENT OF THE NAVY

1. Text Revised
2. Text Revised
3. Text Revised

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

UNITED STATES MARINE CORPS
6TH MARINE CORPS DISTRICT
75 PIEDMONT AVENUE
ATLANTA, GEORGIA 30303

IN REPLY REFER TO

31 JAN 1979

Mr. John L. Rankin
Outer Continental Shelf Office
U.S. Department of the Interior
500 Camp Street, Suite 841
New Orleans, Louisana 70130

Dear Sir:

Your letter of 26 January 1979 concerning oil and gas lease sale, number 58A, has been reviewed by this Headquarters and the proposed action has no effect on the mission of the Sixth Marine Corps District.

This sale holds no interest for this Headquarters and a negative response is submitted.

E. G. WEATHERFORD
Colonel, U.S. Marine Corps
Director

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Department of Energy
Region IV
1655 Peachtree Street, NE
Atlanta, Georgia 30309

NEW ORLEANS OCS
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STUDIES
MGMT. SER.

March 19, 1979

Mr. John L. Rankin, Manager
U. S. Department of the Interior
500 Camp Street, Suite 841
New Orleans, Louisiana 70130

Dear Mr. Rankin:

The Draft Environmental Impact Statement (EIS) for the 1979 Outer Continental Shelf Oil and Gas Lease Sale 58A has been received by this office and has been reviewed for a determination of specific areas of environmental concern to the U. S. Department of Energy. The Department of Energy encourages the development of the Outer Continental Shelf (OCS) in an environmentally responsible manner in order to assure the continued supply of oil and gas resources essential to the national interest.

Our review of the EIS indicates that all major environmental concerns for which this office has expertise have been adequately addressed. We recommend that the OCS development be fully coordinated with the developing Alabama and Mississippi Coastal Zone Management Plans. Perhaps we can be of assistance in determining what requirements any OCS developer will need to meet before permitting. Additionally the Department of Energy anticipates expanded geothermal exploration in the Southeast which may involve the Gulf area. At this time the exploration is centered off the Atlantic coasts of Georgia and the Carolinas.

As a result of our review of the Environmental Impact Statement we have determined there are no other significant environmental considerations for which the Department of Energy has jurisdiction by law or expertise. If we may be of further assistance to you or advise you on any energy concern you may have, please contact Bill Rankin, Environmental Programs Manager, of my staff at telephone 404/881-4464.

Sincerely,

Louis F. Centofanti
Regional Representative

cc: Director
Division of NEPA Affairs, NDOE

DOE Liaison (A-104), EPA

RESPONSE TO COMMENTS BY THE DEPARTMENT OF ENERGY, REGION IV

Coordination with affected states is maintained throughout the leasing process. BLM meets with the states in order to: identify issues to be addressed in EIS's; identify studies needs; develop protective stipulations; and even in selecting the specific tracts to be offered. Furthermore, BLM comments, when asked, on state CZM plans.

DEPARTMENT OF ENERGY
REGION VI
DALLAS, TEXAS

MAR [illegible] 1979

John L. Rankin, Manager
U. S. Department of Interior
Bureau of Land Management
500 Camp Street, Suite 841
New Orleans, Louisiana 70130

Dear Mr. Rankin:

The Proposed 1979 Outer Continental Shelf Oil and Gas Lease Sale 58A, Western and Central Gulf of Mexico, Draft Environmental Impact Statement has been reviewed and we have no comments.

Sincerely,

Curtis E. Carlson Jr.
fr G. Dan Rambo
Regional Representative

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FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

MAR 15 1979

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Manager, New Orleans OCS Office
Bureau of Land Management
500 Camp Street, Suite 841
New Orleans, Louisiana 70130

Dear Sir:

We appreciate the opportunity to comment on the draft environmental impact statement (DEIS) evaluating the proposed Western and Central Gulf of Mexico Outer Continental Shelf (OCS) Oil and Gas Lease Sale No. 58A. The Federal Energy Regulatory Commission's (FERC) Office of Pipeline and Producer Regulation (OPPR) offers the following comments:

(1) Upon FERC staff inquiry, your office indicated that the quantity of estimated gas reserves shown on page 7 in table I-3 should be corrected to read billion cubic feet instead of million cubic feet. 1.

(2) The discussion of existing oil and gas development beginning on page 105 should mention the LNG import terminal approved by the former Federal Power Commission (now the FERC) for construction at Lake Charles, Louisiana. This facility will have an average gas sendout rate of approximately 425 million cubic feet per day and is expected to begin importing gas from Algeria during 1980. 2.

(3) The paragraph on page 16 of the DEIS describing the function of the FERC is inadequate. The following is proposed as a substitute: 3.

> Pursuant to the Department of Energy Organization Act, 91 Stat. 565 (1977), many of the functions formerly under the jurisdiction of

the Federal Power Commission were transferred to the FERC within the Department of Energy. The FERC has responsibility to safeguard public convenience and necessity by certifying proposed interstate natural gas facilities. Additionally, on November 8, 1978, the National Energy Act (NEA) was signed into public law. The National Gas Policy Act (NGPA) is one part of the comprehensive NEA. The FERC will be primarily responsible for administering and enforcing the NGPA. 3.

On page 181, the DEIS does not clearly describe the FERC's functions concerning OCS-related oil responsibilities. In regard to these existing responsibilities, the DOE Organization Act specifically transferred to FERC "all functions and authority of the Interstate Commerce Commission or any officer or component of such Commission where the regulatory function establishes rates or charges for the transportation of oil by pipeline or establishes the valuation of any such pipeline." 4.

Also, on page 181, the spelling of the acronym FETC should be corrected to read FERC.

(4) The Commission staff supports the establishment of the proposed "Intergovernmental Planning Program for the Leasing and Transportation of OCS Oil and Gas," as described beginning on page 182. The creation of Regional Working Groups to assure the timely notification of proposed pipeline routes and other related OCS oil and gas activities by directly involving Federal, state, and local government in the planning and decisionmaking process is desirable. 5.

> The FERC staff currently assumes an active role in the evaluation of offshore OCS projects under the authority of the Natural Gas Act, the NGPA, and the OCS Lands Act, as amended. The Commission staff can offer valuable expertise and input to the Regional Working Groups in their goal to facilitate the orderly and timely development of hydrocarbon resources and the protection of environmental resources on the OCS and coastal areas. If we can assist you in this program, please do not hesitate to contact my office. 5.

The DEIS describes a hydrocarbon resource area of considerable significance to future domestic energy production. The Commission staff recognizes the national importance of OCS exploration and development as well as the need for effective environmental safeguards. Based upon a review of your DEIS, we believe that the proposed OCS oil and gas lease sale is in the national interest.

Barry L. Haase

Barry L. Haase, Director
Office of Pipeline and Producer
Regulation

RESPONSES TO COMMENTS BY THE FEDERAL ENERGY REGULATORY COMMISSION

1. Text corrected.

2. Section II.C.3.d(A) has been revised to reflect this comment.

3. Section I.C.4. paragraph three has been revised to more adequately reflect the mission of FERC.

4. Section IV.C.1. has been corrected and the information you provided included.

5. We appreciate your comment and look forward to the cooperation of FERC in support of the Intergovernmental Planning Program for the Leasing and Transportation of OCS Oil and Gas. You may wish to note the comments made by the Texas General Land Office informing us of a pipeline corridor study in Texas supported under the Coastal Energy Impact Program.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION IV
101 MARIETTA TOWER Suite 1503
ATLANTA, GEORGIA 30323

March 9, 1979

OFFICE OF THE
Principal Regional Official

HEW-909-1-79

Mr. John L. Rankin, Manager
U. S. Department of the Interior
Bureau of Land Management
500 Camp Street, Suite 841
New Orleans, Louisiana 70130

Subject: Proposed Central and Western Gulf of Mexico Outer Continental Shelf Oil and Gas Lease Sale 58A

Dear Mr. Rankin:

We have reviewed the subject draft Environmental Impact Statement. Based upon the data contained in the draft, it is our opinion that the proposed action will have only a minor impact upon the human environment within the scope of this Department's review. The impact statement has been adequately addressed for our comments.

Sincerely yours,

James E. Yarbrough

James E. Yarbrough
Regional Environmental Officer

cc: A. McGee
R. Goldberg

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DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333
TELEPHONE: (404) 633-3311

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February 27, 1979

Mr. John L. Rankin
New Orleans Outer Continental Shelf Office
Hale Boggs Federal Building
500 Camp Street, Suite 841
New Orleans, Louisiana 70130

Dear Mr. Rankin:

We have reviewed the draft environmental statement on the Proposed 1979 Outer Continental Shelf Oil and Gas Lease Sale 58A. We are responding on behalf of the Public Health Service.

The overall statement seems to adequately address most issues related to
offshore drilling endeavors. One area of concern not identified was the
treatment or disposal of sanitary waste resulting from personnel on the 1.
production platforms. If treatment or disposal is not planned, will dyes
or other markers be used for identification until absorption or dilution
is complete?

While we recognize the need for offshore exploration, we hold some concerns
with the use of bactericides and the specialized or introduced muds used in
the drilling process. Much of the present data is inconclusive in projecting
the toxicity of these muds on the marine environment from acute
or chronic exposures. The fact that many of these muds are toxic and have
excessive metal concentrations warrants concern, especially when they are
dredged or chemically altered. This may impose an insult on a relatively 2.
uncontaminated environment.

The Environmental Protection Agency is presently conducting a research project on the use of muds and bactericides associated with drilling operations. Until these studies are complete and we have more definitive toxicity data, their uses should be minimized and caution employed at all times.

Thank you for the opportunity of reviewing this document. We would appreciate receiving a copy of the final statement when it is issued.

Sincerely yours,

Frank S. Lisella

Frank S. Lisella, Ph.D.
Chief, Environmental Affairs Group
Environmental Health Services Division
Bureau of State Services

RESPONSE TO COMMENTS BY DHEW, PUBLIC HEALTH SERVICE

1. The Environmental Protection Agency regulates the disposal of sanitary wastes and other effluents as mentioned in Sec. IV, D, No. 6 of the EIS.

2. Stipulation No. 3 in Sec. IV, D, No. 8 prevents the use of high toxic bactericides in drilling fluids.

IN REPLY REFER TO

1792 (930)

March 3, 1849

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

EASTERN STATES OFFICE
7981 Eastern Avenue
Silver Spring, Maryland 20910

MAR 19 1979

Memorandum

To: Manager, New Orleans OCS Office

From: Director, Eastern States

Subject: Oil and Gas Lease Sale 58A

We have reviewed your Draft Environmental Statement on the proposed Central and Western Gulf of Mexico Outer Continental Shelf Oil and Gas Lease Sale 58A. We have only a few minor comments to make.

First of all, the discussion of oil imports can be updated and strengthened if a brief discussion is added on recent developments - e.g., loss of Iranian oil, potential development in Mexico and and recent increases in oil prices. 1.

Secondly, in the appendix it is noted that no manatee are present west of Ancilla and Port St. Joe Rivers, Florida. However, manatee were recently seen in coastal waters off Mississippi. We feel manatee should be included in the existing environment and impact discussions. 2.

Thank you for giving us the opportunity to review your draft statement.

Lowell J Udy

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RESPONSES TO COMMENTS BY USDI, BUREAU OF LAND MANAGEMENT, EASTERN STATES OFFICE

1. The text in Section VIII.B.8.a. has been revised to reflect more current developments of oil imports.

2. Appendix H of the DEIS has been deleted from the FES. The recent siting of the manatee in Mississippi coastal waters was officially considered an aberration. No measurable effect on the manatee or its habitat is expected to result from this lease proposal.

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

SOUTHERN REGION
P. O. BOX 20636
ATLANTA, GEORGIA 30320

January 31, 1979

Mr. John L. Rankin, Manager
U. S. Department of the Interior
Bureau of Land Management
500 Camp Street, Suite 841
New Orleans, Louisiana 70130

Re: Draft EIS for the proposed Central and Western Gulf or Mexico

Dear Mr. Rankin:

This will acknowledge receipt of your letter dated January 26, 1979, regarding the draft Environmental Impact Statement for the proposed Central and Western Gulf of Mexico Outer Continental Shelf Oil and Gas Lease Sale 58A.

We have reviewed the project with respect to potential environmental impact for which this agency has expertise. Our review indicates there will be no significant adverse effects to the existing or planned air transportation system as a result of this project.

Thank you for the opportunity to review and comment on this proposal.

Sincerely,

BENNY C. FRAZIER
Chief, Planning and Appraisal Staff

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MAR 16 1979

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Mr. John L. Rankin, Manager
New Orleans OCS Office
Bureau of Land Management
U. S. Department of the Interior
Hale Boggs Federal Building, Suite 841
500 Camp Street
New Orleans, Louisiana 70130

Dear Mr. Rankin:

Reference: 1792 #58A(732)

This is in response to the request of January 23, 1979 for comments from the Nuclear Regulatory Commission related to the Draft Environmental Statement on Proposed 1979 Outer Continental Shelf Oil and Gas Lease Sale 58A, Western and Central Gulf of Mexico.

The Nuclear Regulatory Commission has no projects or proposed activities in this area, and there would not be any conflicts resulting from a possible lease sale.

The possibility of siting of floating nuclear power plants in Atlantic and Gulf Coast locations has been considered in a generic environmental impact assessment by NRC (NUREG-0056, September 1976; and NUREG-0502, December 1978). Such floating plants would be authorized for manufacture and operation pursuant to licenses issued by the NRC. Although the NRC is currently reviewing an application for the manufacture of eight floating nuclear plants, no application or preliminary discussion has come to NRC for siting such a facility in a Gulf Coast location. The possibility exists for some interaction between offshore nuclear power plants and recovery of offshore resources; however, with careful site selection for the nuclear plant, no significant interference should occur. This matter would be assessed in detail for any specific proposal for an offshore nuclear plant.

We appreciate the opportunity to furnish these comments.

Sincerely,

Wm D. Regan Jr
for Voss A. Moore, Assistant Director
for Environmental Projects
Division of Site Safety
and Environmental Analysis

cc: EPA (5)

RESPONSES TO COMMENTS BY THE NUCLEAR REGULATORY COMMISSION

We appreciate information on long range alternative or supplemental energy considerations. Should a floating nuclear power plant be proposed for the Gulf of Mexico, future environmental analyses regarding oil and gas leasing and development in the Gulf will consider such a proposal.

STATE OF ALABAMA

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

64 NORTH UNION STREET

MONTGOMERY, ALABAMA 36130

FOB JAMES
GOVERNOR

JOHN (TOPPY) HODNETT
COMMISSIONER

SIDNEY B. BLEDSOE
ASST. COMMISSIONER

February 2, 1979

Mr. John L. Rankin, Manager
OCS Office - BLM
U.S. Department of the Interior
500 Camp Street, Suite 481
New Orleans, Louisiana 70130

RE: OCS Lease Sale 58-A

Dear Mr. Rankin:

The Alabama Department of Conservation and Natural Resources has reviewed the proposed OCS Sale 58-A and has no comment on this sale in the central and western Gulf of Mexico. Thank you for the opportunity to comment on this proposal.

Best regards,

Sincerely,

John Hodnett

John W. Hodnett, Commissioner
Department of Conservation and
Natural Resources

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State of Louisiana

EDWIN W. EDWARDS
GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

WILLIAM C. HULS
SECRETARY

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February 1, 1979

Mr. John Rankin, Manager
U. S. Department of the Interior
Bureau of Land Management
New Orleans Outer Continental Shelf Office
500 Camp Street - Suite 841
New Orleans, Louisiana 70130

Re: OCS Sale No. 58A

Dear Mr. Rankin:

Thank you for the opportunity to comment on the draft environmental statement for the proposed OCS Sale No. 58A.

Certain data included in the statement seems to be out of date, particularly on pages 111 and 113 with respect to petroleum refineries, their number and operations, and on page 115 with respect to manufacturing and to sand and gravel production within Louisiana.

We agree that any reserves found as a result of Sale No. 58A will probably find a ready market through existing connections and therefore no additional pipelines to shore will likely be required. Therefore, Louisiana's beaches and wetlands would probably not be affected by construction as a result of this sale. Indications are that the sale would have a positive effect on recreational fishing, and no adverse effect on air quality. Oil spill contingency plans now operational appear adequate to prevent environmental damage should an oil spill occur as a result of production operations or transportation of production resulting from this sale.

Therefore, we recommend that OCS Sale No. 58A be held as scheduled. It is our opinion also, that restrictions in Section 1V.D.7 are sufficient to permit the inclusion of Tract 115 in the proposed sale.

P.O. BOX 44396 . BATON ROUGE, LA. 70804 . PHONE 342-4500
NATURAL RESOURCES BUILDING

However, until a satisfactory agreement is reached with the Department of Interior implementing Section 8(g) of the OCS Lands Act Amendments, we reserve our right to object to the inclusion of those tracts proposed for OCS Sale No. 58A that will be subject to the provisions of said Section 8(g).

We wish to also point out two apparent typographical errors - in table I-3, page 7, (bottom of the page), the same abbreviation is used for both "billion cubic feet" and "billion cubic feet per day", and on page 40, top paragraph, the "(126.6 inches) of mercury" would seem to be in error.

Thank you again for the opportunity to offer our views.

Sincerely,

William E. Howe

William E. Howe
Chief Engineer

WEH:mbp

RESPONSE TO COMMENTS BY THE STATE OF LOUISIANA

The text has been revised and certain non-relevant sections have been deleted.

State of Louisiana
Department of Urban and Community Affairs
Office of Planning and Technical Assistance

EDWIN EDWARDS
GOVERNOR

LEON R. TARVER, JR.
SECRETARY

CARL WILKINS
ASSISTANT SECRETARY

February 5, 1979

Mr. John L. Rankin, Manager
U. S. Department of the Interior
Bureau of Land Management
500 Camp Street, Suite 841
New Orleans, Louisiana 70130

Re: Draft Environmental Statement for Proposed Central & Western Gulf of Mexico Outer Continental Shelf Oil and Gas Lease Sale 58A.

Dear Mr. Rankin:

We are in receipt of the above referenced environmental assessment and have reviewed it for state and local agency review responsibilities. Those agencies selected to receive and review a copy of the statement are listed below. Any comments forthcoming from these agencies will be forwarded to you prior to the comment closing date.

A copy of the statement will be kept on file in our library for public inspection.

We appreciate the opportunity to review this proposal.

Sincerely,

George P. Gullett

George P. Gullett
Environmental Coordinator
Office of Planning and
Technical Assistance

GPG:dn

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Copies of Statement sent to:
- Capital Region Planning Commission
- St. Bernard Parish Planning Commission
- Houma City Planning Commission
- Office of State Parks
- St. Tammany Parish Planning Commission

P. O. BOX 44455—BATON ROUGE, LOUISIANA 70804—389-5664

F/NC

Sale 58 A Files

OFFICE OF THE GOVERNOR
Planning & Coordination
1503 Walter Sillers Building
JACKSON, MISSISSIPPI 39201
354-7018

CLIFF FINCH
GOVERNOR

STATE CLEARINGHOUSE FOR FEDERAL PROGRAMS

JAMES A FLEMING
DIRECTOR

TO: U.S. Department of Interior Bureau
of Land Management
N. O. Outer Continental Shelf
Hale Boggs Federal Building
500 Camp Street, Suite 841
New Orleans, LA 70130

Attn: John L. Rankin, Manager

STATE CLEARINGHOUSE NUMBER

79020612

DATE: February 27, 1979

PROJECT DESCRIPTION:

Draft Environmental Statement for the proposed Central and Western Gulf of Mexico Outer Continental Shelf Oil and Gas Lease Sale 58A. A public hearing will be held at the New Orleans OCS Office on March 13, 1979. Comments should be submitted to the address above.
Multi States/ TEXAS, LOUISIANA, MISSISSIPPI, ALABAMA

The State Clearinghouse, in cooperation with the state agencies interested or possibly affected, has completed the A-95 review of the project described above.

None of the state agencies involved in the review had comments or recommendations to offer at this time. This concludes the State Clearinghouse review, and we encourage appropriate action as soon as possible.

A copy of this letter is to be attached to the application as evidence of compliance with the A-95 requirements.

Lester Howell

Lester Howell, Coordinator
Clearinghouse for Federal Programs

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OFFICE OF THE GOVERNOR

WILLIAM P. CLEMENTS, JR.
GOVERNOR

March 13, 1979

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Mr. John L. Rankin
U. S. Department of the Interior
Bureau of Land Management
500 Camp Street, Suite 841
New Orleans, Louisiana 70130

Dear Mr. Rankin:

The Draft Environmental Impact Statement for the Proposed Central and Western Gulf of Mexico Outer Continental Shelf Oil and Gas Lease Sale 58A, has been reviewed by the Budget and Planning Office and interested State agencies. Agency comments were sent to you by letter dated March 1, 1979.

Subsequent to the completion of that review, the enclosed comments from the General Land Office were received. Those comments are being forwarded to you at this time for your use in the preparation of the final environmental impact statement.

It is hoped that the delay in the receipt of these comments will be of no inconvenience to you.

Sincerely,

Donald C Harley
Don Harley, Coordinator
Economic Development and Transportation
Budget and Planning Office

Enclosure

EXECUTIVE OFFICE BUILDING • 411 WEST 13TH STREET • AUSTIN, TEXAS 78701

OFFICE OF THE GOVERNOR

WILLIAM P. CLEMENTS, JR.
GOVERNOR

March 1, 1979

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Mr. John L. Rankin
U. S. Department of the Interior
Bureau of Land Management
500 Camp Street, Suite 841
New Orleans, Louisiana 70130

Dear Mr. Rankin:

The Draft Environmental Impact Statement for the Proposed Central and Western Gulf of Mexico Outer Continental Shelf Oil and Gas Lease Sale 58A, has been reviewed by the Budget and Planning Office and interested State agencies.

The comments of the reviewing agencies are enclosed for your use in the preparation of the final environmental impact statement. If this Office can be of further assistance, please contact us.

Sincerely,

Tom B. Rhodes

Tom B. Rhodes, Director
Budget and Planning Office

Enclosures

EXECUTIVE OFFICE BUILDING • 411 WEST 13TH STREET • AUSTIN, TEXAS 78701

TEXAS DEPARTMENT OF WATER RESOURCES
1700 N. Congress Avenue
Austin, Texas

TEXAS WATER DEVELOPMENT BOARD
A. L. Black, Chairman
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Harvey Davis
Executive Director

TEXAS WATER COMMISSION
Felix McDonald, Chairman
Dorsey B. Hardeman
Joe R. Carroll

RECEIVED
FEB 28 1979
Budget/Planning

February 22, 1979

Mr. Tom B. Rhodes, Director
Governor's Budget and Planning Office
Executive Office Building
411 West 13th Street
Austin, Texas 78701

Dear Mr. Rhodes:

Re: U.S. Department of the Interior, Bureau of Land Management -- Draft Environmental Impact Statement -- Proposed 1979 Outer Continental Shelf Oil and Gas Lease Sale 58A, Western and Central Gulf of Mexico. Two Volumes. N.D. (State of Texas Reference: EIS-9-001-021).

In response to your February 1 memorandum, the Texas Department of Water Resources (TDWR) has reviewed the subject Draft Environmental Impact Statement (EIS), prepared by the U.S. Department of the Interior, Bureau of Land Management (BLM) relative to the proposed lease sale in November 1979, of 115 tracts comprising 545,255 acres on the Outer Continental Shelf (OCS) in federal waters in the Gulf of Mexico, located from 3 to 165 nautical miles offshore of Texas, Louisiana, Mississippi, and Alabama. Approximately 58 percent of these tracts are gas prone, 4 percent are oil prone, and 38 percent are both oil and gas prone (p. 3, sect. IA1). BLM indicates that probable reserves to be discovered by the lease sale are estimated at 21.6-59.8 MMB of oil, and 359.6-893.4 MMCF of gas, involving estimated total development costs ranging from $255.8 million to $652.0 million (pp. 3, 6).

TDWR offers the following staff review comments, from the standpoint of TDWR's statutory statewide responsibilities relative to the planning, development, management, and regulation of water resources, water quality, wastewater, industrial solid waste, and oil or hazardous substances spill or accidental discharge:

1. Pages 147, 152, 162.

   For the following reasons, TDWR concurs in the basic thrust of the Draft EIS that the proposed lease sale is expected to have minimal impacts on the State of Texas, that areas of concern have been identified, and adequate assurances furnished that appropriate preventive, remedial, or mitigative actions will be taken:

P.O. Box 13087 Capitol Station • Austin, Texas 78711 • Area Code 512/475-3187

a. Of the 115 tracts, most lie off the Louisiana coast. Twenty-three of the tracts are scattered on the OCS off Texas. Only 50 of the proposed 115 least tracts are considered oil prone, and none of these are off the Texas coast (p. 152).

b. The estimated induced population increase due to the proposed sale (i.e. 627 persons in 1981, 5470 in 1985, 3297 in 1989, and 2897 in 1993), occurring mainly in Brazoria County, is considered to be a relatively small incremental addition to the expected population trend and pattern of the region (p. 162). However, TDWR believes that it is well to note that because OCS oil and gas recovery operations can affect a large area, the region chosen for forecasting potential impacts of OCS lease sales are typically large. The size and shape of a chosen region can enormously influence the resulting apparent effects of the proposed OCS activity. Therefore, what may be a dramatic change in economic activity for a small community may be trivial for a county or state, and infinitesimal for the nation.

c. Since it is anticipated that no new pipelines to facilities onshore will be required (p. 8), damage and alterations to beach and shoreline areas are precluded or minimized (p. 147).

d. Oil and gas exploration and development are already occurring in State waters, between shoreline resources and the nearest tract offerings for lease sale 58A (p. 152).

e. In order to minimize and avoid a buildup of adverse impacts on coastal ecosystem resulting from possible nearshore dredging needs associated with the future oil and gas development and production activities on the offshore Texas tracts included in Lease Sale No. 58A, it appears that the following basic mitigative measures have been adopted: (1) use of existing navigation channels and waterways; (2) maximum use of existing pipelines instead of channel; and (3) adopt dredging techniques and equipment designed to reduce the frequency of maintenance dredging (pp. 69-70, 149-150).

f. Adequate assurance is furnished that the study efforts associated with the Environmental Studies Program mandated by the OCS Lands Act Amendments will provide vital information needed by decision-makers for the prediction, assessment, and management of impacts on the human, marine, and coastal environments of the OCS and the Texas nearshore areas which may be affected (pp. 10, 15).

g. Adequate assurance is furnished of intended future compliance with the provisions of the OCS Lands Act Amendments requiring monitoring of the environment after leasing and development of the OCS tracts, in order to identify significant changes in the environment, and to assess the cumulative effects of OCS activities on the environment (p. 10).

RESPONSE TO COMMENTS BY TEXAS DEPARTMENT OF WATER RESOURCES

The concentration of all the impacts that will fall along the Texas Coast into one county is in itself unrealistic, but it was done to examine a high impact scenario. Concentration into one community is possible from a theoretical standpoint in order to create a worst case scenario; however, the only population projections to 1993 that we had were on a county level.

General Land Office
AUSTIN, TEXAS 78701
BOB ARMSTRONG, COMMISSIONER

Environmental Management Program
1700 North Congress
Austin, Texas 78701

March 9, 1979

Mr. Franklin H. Douglas, Jr.
Budget and Planning Office
Office of the Governor
411 West 13th Street
Austin, Texas 78701

Attention: Mr. Ward Goessling, Jr.

Re: Proposed 1979 Outer Continental Shelf Oil and Gas Lease Sale 58A
(EIS 9-001-021)

Gentlemen:

The documents relating to the above cited project have been reviewed and we have no objections to the Outer Continental Shelf Oil and Gas Lease Sale 58A in November 1979.

We would like to bring to the attention of the Department of Interior and to your office, the recently granted Pipeline Corridor Study secured by the General Land Office from the Coastal Energy Impact Program funds. The results of the study will aid the state in identifying potential pipeline corridors for flow lines originating in the Federal Outer Continental Shelf which lands fall in Texas. This should reduce the impact of these activities on valuable wetland resources, submerged lands and dune areas. We hope to be able to work closely with the Department of Interior and your office during the 12-month term of this grant. 1.

We appreciate this opportunity to review and comment on this document.

Sincerely,

A. J. Bishop

A. J. Bishop
512/475-1540

Approved: Mike Hightower
Mike Hightower
Program Manager/Director

AJB/cc

RESPONSE TO COMMENT BY THE TEXAS GENERAL LAND OFFICE

1. We are pleased to learn of your pending pipeline corridor study. BLM has recently adopted the Intergovernmental Planning Program for OCS Oil and Gas Leasing, Transportation and Related Facilities which encourages pipeline corridor studies.

TEXAS AIR CONTROL BOARD

8520 SHOAL CREEK BOULEVARD
AUSTIN, TEXAS 78758
512/451-5711

JOHN L. BLAIR
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WILLIAM D. PARISH
JEROME W. SORENSON, P. E.

February 20, 1979

RECEIVED
FEB 23 1979
Budget/Planning

Mr. Ward C. Goessling, Jr.
Natural Resources Section
Budget and Planning Office
Office of the Governor
411 West 13th Street
Austin, Texas 78701

Subject: Draft Environmental Impact Statement: Proposed 1979 O.C.S. Oil and Gas Lease Sale No. 58A EIS 9-001-021

Dear Mr. Goessling:

We have no objections to this document. The air contaminant emissions associated with the project described will have an insignificant impact on ambient air quality. The proposed activities are consistent with the Texas Air Pollution Control Implementation Plan.

Thank you for the opportunity to review this document. If we can be of further assistance, please contact me.

Sincerely,

Joe Pennington
for

Roger R. Wallis, Deputy Director
Standards and Regulations Program

cc: Mr. Lloyd Stewart, Regional Supervisor, Bellaire
Mr. Howard Baker, Regional Supervisor, Beaumont
Mr. Bob Guzman, Regional Supervisor, Harlingen
Mr. Tom Palmer, P.E., Regional Supervisor, Corpus Christi

Southwest Louisiana Clearinghouse Review Board

P. O. BOX 3164 • LAKE CHARLES, LOUISIANA 70602
PHONE (318) 433-1771

February 15, 1979

John L. Rankin, Manager
New Orleans OCS Office
U. S. Department of the Interior
Bureau of Land Management
500 Camp Street, Suite 841
New Orleans, LA 70130

Dear Mr. Rankin:

REFERENCE: Draft Environmental Statement
Proposed Central and Western Gulf of Mexico Outer Continental
Shelf Oil and Gas Lease Sale 58A

The above-referenced proposal has been reviewed by this office, and it has been found to be consistent with local planning goals and objectives. The proposal has also been reviewed by IMCAL's Environmental Planner, Rick Ransonet, who commented:

> "The draft environmental statement is of significance to Louisiana and the Southwest region of the state. Because of the increasing demand for oil and gas, we must utilize our resources to the fullest, while striving to enhance the quality of our environment; which is to say that we should continue to progress but with the utmost care for preserving our valuable wetland areas. Any consequence that offshore drilling will have on our wetlands must be determined to assess whether it will have a detrimental effect. If this is so, then another way must be found to recover this energy. There are many typographical errors, especially in statistics listings, which should be corrected to enable proper deciphering of all available data....Rick Ransonet, Director of Natural Resources"

If we can assist you in any other way, please contact our office.

Very truly yours,

Delores D. Green

Delores D. Green
A-95 Coordinator

DDG/s

xc: Mrs. Ruth McDonner, DUCA-OSC

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IMPERIAL CALCASIEU REGIONAL PLANNING AND DEVELOPMENT COMMISSION
SECRETARIAT

RESPONSE TO COMMENTS BY THE SOUTHWEST LOUISIANA CLEARINGHOUSE REVIEW BOARD

The only actual concern expressed by the reviewer is that consequences of offshore drilling on wetlands must be determined. We have received comments from appropriate State OCS representatives identifying information needs, including that of impact on wetlands. We are presently planning studies to determine certain impacts; other impacts may be identified as a result of our presently on-going coastal characterization studies, performed by the U.S. Fish and Wildlife Service. The results of these studies will be made available to the public, including appropriate State OCS representatives. Additional or unresolved issues and pertinent studies/information needs may be identified by those representatives through the recently enacted Intergovernmental Planning Program, which focuses on the nearshore problems of oil and gas development, with emphasis on transportation issues.

HGAC HOUSTON·GALVESTON AREA COUNCIL

28 February 1979

Manager, New Orleans OCS Office
Bureau of Land Management
Hale Boggs Federal Building
500 Camp St., Suite 841
New Orleans, LA 70130

MEMORANDUM

TO: Proponents of Applications

FROM: Houston-Galveston Area Council Project Review Committee

RE: Review of proposed projects and planning activities by the Project Review Committee

The next regular meeting of the Project Review Committee will be held in the Conference Room, 3701 West Alabama, Houston, Texas, on the date of the attached agenda.

The presence of the proponent or his authorized agent to explain and discuss his application is most beneficial if questions arise requiring clarification or if additional information should be requested.

A copy of the agenda is attached for your information.

Attachment: Agenda

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____ MGMT. SER. ____

P. O. BOX 22777
3701 WEST ALABAMA

713-627-3200
HOUSTON, TEXAS 77027

SAI # 902-16063

Draft EIS

APPLICANT:	Bureau of Land Management, U.S. Dept. of Interior
TITLE & DESCRIPTION:	Draft Environmental Impact Statement Proposed 1979 Outer Continental Shelf Oil and Gas Lease Sale No. 58A
PROJECT SPONSOR:	Manager, New Orleans OCS Office Bureau of Land Management Hale Boggs Federal Building 500 Camp St., Suite 841 New Orleans, LA 70130
H-GAC STAFF:	Steve Brooks, Community Planner
LOCATION:	Offshore Texas, Louisiana, Mississippi and Alabama 6 km to 189 km from shore
ANTICIPATED DATE OF SALE:	November, 1979
AREA AFFECTED:	Western and Central Gulf of Mexico

2-23-79
JSB:s

SAI # 902-16063
Bureau of Land Management
Draft EIS Proposed 1979 OCS Oil
and Gas Lease Sale No. 58A

SYNOPSIS: The proposed lease sale under consideration includes 122 tracts offshore Texas, Louisiana, Mississippi and Alabama. If all leased, they would increase by some 582,000 acres the total under federal lease in the Gulf of Mexico. The EIS includes a thorough description of current social, environmental, economic and related conditions and possible impacts resultant from the proposed lease sale.

STAFF COMMENTS: The threats to environmental quality and coastal aesthetics posed by the exploration, development and transportation of Outer Continental Shelf (OCS) oil and gas resources are adequately weighed in this Draft EIS. In light of past experience and the careful vigilence of government agencies, it seems reasonable to assume that safe operations will continue in the Gulf of Mexico.

On-shore impacts of increased offshore activities were analyzed and considered to be minimal. A corolary federal program to aid areas impacted by offshore oil and gas activities is the Coastal Energy Impact Program (CEIP), which has seen recent use by H-GAC coastal counties.

TENTATIVE AGENDA

Houston-Galveston Area Council

PROJECT REVIEW COMMITTEE

6 March 1979

9:30 a.m.

Conference Room
3701 West Alabama

H-GAC File Number and Location (Area Affected)	Applicant and Description

PHYSICAL PLANNING AND DEVELOPMENT PROJECTS

1-902-16093

City of Wharton
(Wharton County)

SUNSET VILLA ASSOCIATES, LTD.: 50 Rural Rental Housing Units, Wharton, Texas - loan request for the development of a 50 unit apartment complex. (See Map A)

Total Cost: $ 858,840.00
FmHA Loan Request: $ 800,840.00

2-902-16053

City of Sweeny
(Brazoria County)

FANTASY CORPORATION: 32 Rural Rental Housing Units, Sweeny, Texas - loan request for the development of a 32 unit apartment complex for low and moderate income families in Sweeny, Texas. (See Map B)

Total Cost: $ 564,000.00
FmHA Loan Request: $ 512,000.00

3-903-16006

City of League City
(Galveston County)

CONCRETE SERVICE COMPANY, INC.: Loan for Restructuring of the Company's Debt - loan for the purpose of restructuring current debts and working capital. (See Map C)

Total Cost: $ 2,500,000.00
FmHA Loan Request: $ 2,500,000.00

4-903-16012

Missouri City
(Fort Bend County)

CITY OF MISSOURI CITY: Ridgeview Neighborhood Park - proposal to acquire a 4.362 acre site for park development. (See Map D)

Total Cost: $ 152,000.00
*TPWD/HCRS Grant Request: $ 76,000.00

5-901-50076

State of Texas

TEXAS HISTORICAL COMMISSION: FY '79 Annual Program III of the State Historic Preservation Plan - proposed work program including survey planning and acquisition and development components.

(continued)

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*Texas Parks and Wildlife Department/Heritage Conservation and Recreation Service

H-GAC File Number and Location (Area Affected	Applicant and Description
	Total Cost: $ 6,529,625.00 TPWD/HCRS Grant Request: $ 1,494,000.00
6-902-16047 Eastern Fort Bend County	STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION: FM 1092, From US 90A to Oyster Creek - this segment of FM 1092 will be widened from two lanes to four lanes. (See Map E) Total Cost: $ 1,830,000.00 *FHWA Grant Request: Not Yet Determined
7-902-16048 Waller County	STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION: FM 3346, from junction of FM 1887 and FM 3346, east FM 359 - this segment of FM 3346 will be extended, realigned, and upgraded to current Farm to Market standards. (See Map F) Total Cost: $ 1,132,000.00 FHWA Grant Request: Not Yet Determined
8-902-16049 Brazoria County	STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION: FM 2004 from SH 332 to SH 36 - proposed extension of FM 2004 from SH 332 to SH 36, including a bridge across the Brazos River. (See Map G) Total Cost: $ 3,100,000.00 FHWA Grant Request: Not Yet Determined
9-902-16050 Waller County	STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION: SH 6 from US 290 in Hempstead to the Grimes County Line - this section of SH 6 will be upgraded from an existing two-lane road to a four-lane facility. (See Map H) Total Cost: $ 3,487,000.00 FHWA Grant Request: Not Yet Determined
10-902-16051 Northeast Harris County	STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION: FM 2100, from Wolf Road to Connection with Huffman-Cleveland Road - proposed 2.1 mile, two-lane extension of FM 2100 from Wolf Road to Huffman-Cleveland Road. (See Map I) Total Cost: $ 1,200,000.00 FHWA Grant Request: Not Yet Determined
11-902-16086 City of Baytown (Eastern Harris County)	CITY OF BAYTOWN: Baytown Municipal Airport Master Planning Study, Environmental Impact Assessment Report - report analyzes the impacts of a proposed Baytown Municipal Airport on several alternate sites. (See Map J)
11(A)-902-16063 Western and Central Gulf of Mexico	BUREAU OF LAND MANAGEMENT: Draft Environmental Impact Statement, Proposed 1979 Outer Continental Shelf Oil and Gas Lease Sale No. 58A - proposed lease sale under consideration includes 122 tracts off-shore Texas, Louisiana, Mississippi and Alabama.

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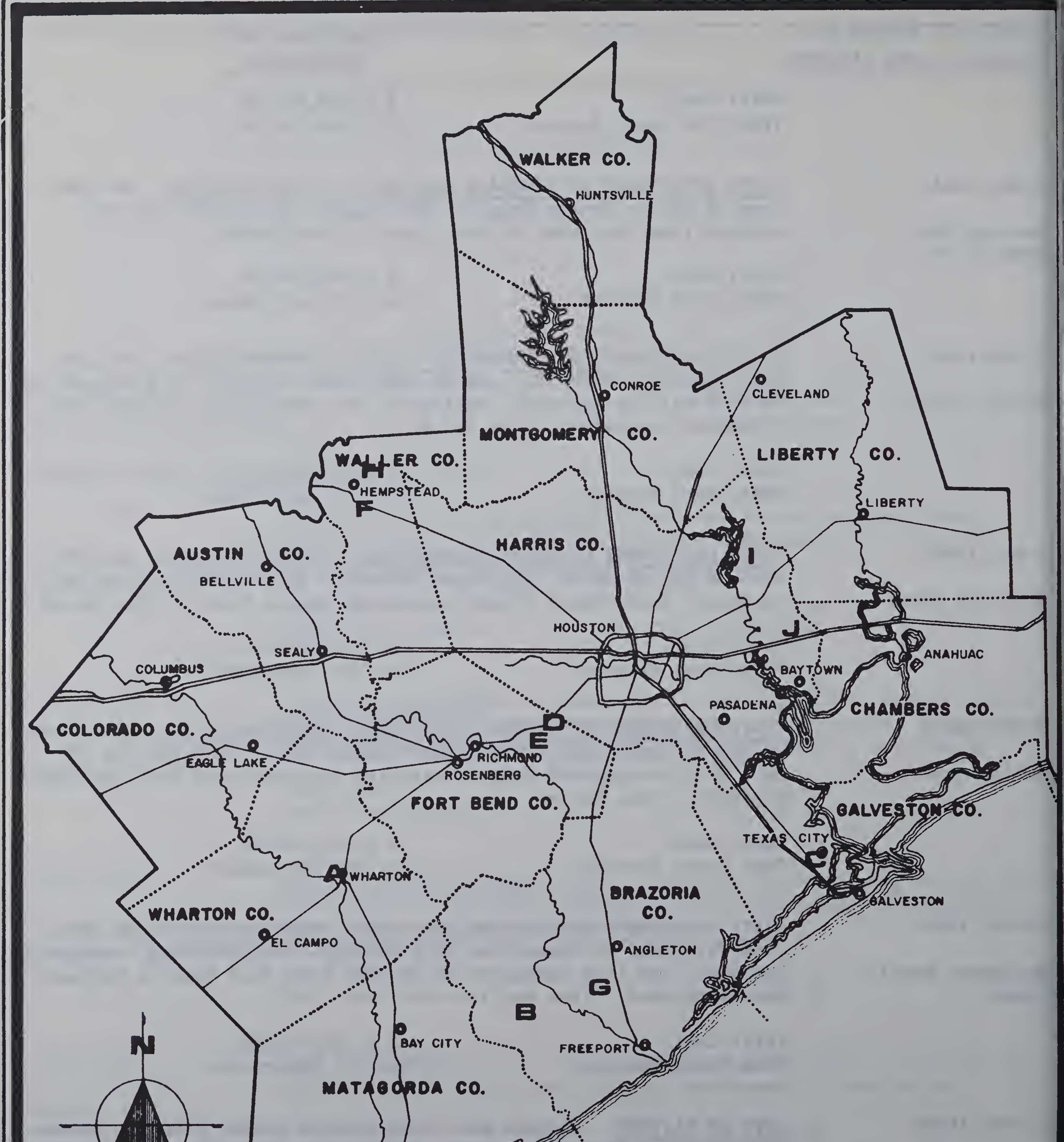
*Federal Highway Administration


WALKER CO.
HUNTSVILLE
CONROE
MONTGOMERY CO.
CLEVELAND
LIBERTY CO.
LIBERTY
WALLER CO.
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HEMPSTEAD
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HARRIS CO.
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AUSTIN CO.
BELLVILLE
HOUSTON
J
ANAHUAC
SEALY
COLUMBUS
BAYTOWN
PASADENA
CHAMBERS CO.
COLORADO CO.
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EAGLE LAKE
RICHMOND
ROSENBERG
FORT BEND CO.
GALVESTON CO.
TEXAS CITY
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GALVESTON
WHARTON CO.
EL CAMPO
ANGLETON
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BAY CITY
FREEPORT
MATAGORDA CO.
PALACIOS
HOUSTON - GALVESTON AREA COUNCIL

GOLDEN CRESCENT COUNCIL OF GOVERNMENTS

P. O. BOX 2028 VICTORIA, TEXAS 77901 PHONE 512/578-1587
202 E. SANTA ROSA

March 1, 1979

U.S. Department of Interior
Bureau of Land Management
New Orleans Outer Continental Shelf Office
Hale Boggs Federal Building
500 Camp Street-Suite 841
New Orleans, LA 70130

Dear Sirs:

The Board of Directors of the Golden Crescent Council of Governments met on February 28, 1979 and reviewed your Draft Environmental Statement on - proposed 1979 Outer Continental Shelf oil and gas lease sale, 58-A . The Board, however, agreed not to comment on the statement at this time, but will comment on the Final Environmental Impact Statement.

We look forward to seeing the Final Environment Inpact Statement in the future.

Sincerely yours,

Joe Atkinson

Joe Atkinson
Administrative Assistant

JA:jg

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JUDGE H. H. VOLLENTINE–PRESIDENT COMMISSIONER MARVIN LOCKHART–1st VICE PRESIDENT JUDGE L. S. BENGE–2nd VICE PRESIDENT
HARRISON STAFFORD, II–3rd VICE PRESIDENT JUDGE SAM SEALE–IMMEDIATE PAST PRESIDENT
ITASCA STAFFORD–DIRECTOR AT LARGE MAYOR H. O. GIBSON–DIRECTOR AT LARGE TOM GARNER, JR.–LEGAL COUNSEL
MAYOR CHARLES C. CARSNER, JR.–SECRETARY TREASURER ROBERT W. BURR–EXECUTIVE DIRECTOR

CITCO

CITIES SERVICE COMPANY
ENERGY RESOURCES GROUP

Cities Service Building
5100 Southwest Freeway
Box 22082
Houston, Texas 77027
(713) 629-9700

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February 12, 1979

Manager
New Orleans OCS Office
Bureau of Land Management
Hale Boggs Federal Building, Suite 841
500 Camp Street
New Orleans, Louisiana 70130

Re: Availability of Draft Environmental Statement and Holding of Public Hearing Regarding Proposed Oil and Gas Lease Sale No. 58-A - Central and Western Gulf of Mexico

Dear Sir:

Reference is made to Page 5524, et seq., in the Federal Register Vol. 44, No. 19, dated January 26, 1979, wherein notice was made as to availability of Draft Environmental Statement and Public Hearing to be held in New Orleans, Louisiana, on March 6, 1979, regarding a proposed OCS Oil and Gas Lease Sale covering 115 tracts located in the central and western Gulf of Mexico.

Cities Service Company supports the Department in offering these tracts for lease. We also reaffirm our past endorsement of continuing periodic OCS oil and gas lease sales under known and established rules and regulations.

We are of the opinion such an orderly progression is a necessary ingredient to the President's energy program.

We also encourage a timely and orderly development of not only the Gulf of Mexico but all OCS areas. Cities Service also supports the concept of multiple use and therefore respects the concurrent right and obligations of all users. We also feel the industry, within established guidelines, will take necessary steps to protect the environment to the best of its ability during the exploratory and development stages. As an individual company, we continue our pledge to operate present and future offshore facilities with serious and responsible regard for proper environmental considerations as well as consideration for others in the multiple use concept.

Yours very truly,

CITIES SERVICE COMPANY

Jack R. Place

Jack R. Place
General Manager
Exploration & Production
U. S. Offshore Region

JRP/JVY/gr

Shell Oil Company

Offshore Division

One Shell Square
P.O. Box 60124
New Orleans, Louisiana 70160

FEB 19 1979

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Manager, New Orleans OCS Office
Bureau of Land Management
Hale Boggs Federal Building
Suite 841
500 Camp Street
New Orleans, LA 70130

Gentlemen:

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
PROPOSED OCS SALE 58A

Your letter of January 26, 1979, which transmitted a copy of the DEIS for OCS Sale 58A, invited comments concerning this proposed action. Shell Oil Company previously commented on the DEIS for OCS Sale 58 in Mr. L. G. Otteman's letter of October 30, 1978, to you. Those comments dealt with the sections of the DEIS pertaining to produced formation waters as found on pages III-1, III-4 to -6, and III-31.

In reviewing the DEIS for OCS Sale 58A, we note that language identical to that contained in the DEIS for OCS Sale 58 was again used in those sections dealing with produced formation waters discussed on pages III-121, III-125, III-150, and III-196. We request that the comments made on produced formation waters in our October 30, 1978, letter be incorporated as our comments for the DEIS on OCS Sale 58A. 1.

During the latter part of 1978, static bioassays were conducted as indicated in prior mentioned correspondence using subadult and adult brown shrimp (Penaeus aztecus), subadult and adult white shrimp (Penaeus setiferus), the barnacle (Balanus tintinnabulum), and crested blenny (Hypleurochilus geminatus). We quote from the presentation by Dr. Curt D. Rose, Energy Resources Company, Inc., on December 13, 1978, at the EPA/NOAA Buccaneer Oil Field Study project review in Houston, Texas, regarding results of his studies covering "Crustacean and Fish Bioassays" as follows:

> "Formation water treated with bactericide (acrolein) was relatively nontoxic to subadult and adult brown shrimp, subadult and adult white shrimp, the barnacle, and crested blenny. The lowest 96-hour median lethal concentration (LC_{50}) observed during two static toxicity tests with each species/life-stage combination was 33,000 ppm formation water by volume (0.95 confidence interval = 25,000-38,000 ppm), which

> was obtained with the barnacle. The highest 96-hour LC_{50}, 408,000 ppm (0.95 confidence interval = 320,000-560,000 ppm), was observed with the crested blenny."

Dr. Rose further commented that:

> "A limiting permissible environmental concentration (LPC) for formation water treated with bactericide was estimated to be 250 ppm (LPC = 25,000 ppm [lower limit of 0.95 confidence interval of the 96-hour LC_{50} for the barnacle] X 0.01 application factor). Maximum environmental concentration of formation water was estimated through use of EPA's release-zone model to be 0.0003 ppm. Comparison of the LPC with the estimated maximum environmental concentration of formation water suggests that discharge of the formation water does not unduly endanger the marine environment."

Additional information on the Buccaneer Oil Field Study testing can be obtained from Dr. C. W. Caillouet, NMFS Project Director.

Yours very truly,

LG Otteman

L. G. Otteman
Division Production Manager

cc: Dr. C. W. Caillouet
National Marine Fisheries Service
Galveston Laboratory
4700 Avenue U
Galveston, TX 77550
(713) 763-1211 Ext. 525

RESPONSE TO COMMENTS BY SHELL OIL CO.

The text has been revised to incorporate the information provided.

Guarding America's Heritage

National Trust for Historic Preservation

740-748 JACKSON PLACE, N.W. WASHINGTON, D.C. 20006 (202) 638-5200

February 26, 1979

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Mr. John L. Rankin, Manager
New Orleans OCS Office
Bureau of Land Management
500 Camp Street, Suite 841
New Orleans, La 70130

Dear Mr. Rankin:

Returned herewith is the form revising and updating your distribution list. In its role as the national, private, educational nonprofit organization chartered by Congress to facilitate public participation in historic preservation in the United States, the National Trust is naturally interested in assuring that historic preservation concerns are adequately represented in federal agency project considerations. We were pleased to note by letter of November 6 (copy enclosed) your evaluation of the impact on historic and prehistoric cultural resources within proposed lease areas as reflected in the Draft Environmental Impact Statement, Proposed 1979 Outer Continental Shelf Oil and Gas Lease Sale 58, Western and Central Gulf of Mexico, Volumes 1 and 2. However, present staff limitations preclude our reviewing all draft environmental statements. Therefore, as the enclosed form indicates, we wish to be deleted from the mailing list for future environmental statements.

The Advisory Council on Historic Preservation is the federal agency officially charged with responsibility for overseeing federal agency compliance with preservation-related aspects of the National Environmental Policy Act, the 1966 National Historic Preservation Act, and other pertinent federal legislation, regulations or executive orders. As such it regularly receives and considers draft environmental impact statements and other notices relative to environmental review. We assume the Advisory Council is on your distribution list for environmental statements. The chairman of the National Trust is a statutory member of the Advisory Council on Historic Preservation, and our staff maintains a close working relationship with the staff of the Council. 1.

Through contact with public agencies with preservation responsibilities and communication with private organizations and individuals throughout the country, we maintain an awareness of activities affecting historic sites or structures. As issues involving federal agency projects affecting historic property come to our attention we shall request through our

Guarding America's Heritage

National Trust for Historic Preservation

740-748 JACKSON PLACE, N.W. WASHINGTON, D.C. 20006 (202) 638-5200

November 6, 1978

Mr. John L. Rankin, Manager
New Orleans OCS Office
Bureau of Land Management
Hale Boggs Federal Building
500 Camp Street, Suite 841
New Orleans, La. 70130

Dear Mr. Rankin:

As you may be aware, the National Trust for Historic Preservation was chartered by the Congress of the United States in 1949 as a charitable, educational non-profit organization in order to facilitate public participation in the preservation of sites, buildings and objects significant in American history and culture. Because of our responsibilities in this area, we were gratified to note that the Bureau of Land Management has included material on the historic and prehistoric cultural resources within the proposed lease area in its Draft Environmental Impact Statement, Proposed 1979 Outer Continental Shelf Oil and Gas Lease Sale 58, Western and Central Gulf of Mexico, Volumes 1 and 2. The Bureau is to be commended for recognizing the importance of these resources and for utilizing the expertise of the appropriate state historic preservation officers to compile information on them for the Draft EIS.

Your evaluation of the potential impact of the oil and gas lease sale on maritime artifacts was of particular interest to us because of our own activities in this area; in 1975, in fact, the National Trust created a maritime preservation program in order to focus greater attention on the preservation of America's maritime heritage. Several brochures describing this new Trust program and some of its conferences are enclosed.

In addition, the Trust has long been concerned with the problem of archeological site protection and has been exploring, through meetings and conferences, techniques for insuring closer cooperation between archeologists and historic preservationists. We were pleased, therefore, to note that the Draft EIS included data on the affected area's archeological sites and an evaluation of the possible impact of oil drilling and storage operations on these sites.

We appreciate this opportunity to comment on the draft.

Sincerely,

(Sgd) Douglas P. Wheeler

Douglas P. Wheeler
Executive Vice President

DPW/LS/bp
Enclosures

headquarters and regional offices copies of those specific draft environmental impact statements of most immediate concern to the National Trust and its constituency.

While we request deletion from the distribution list, we reiterate our support for the manner in which you have addressed cultural properties in Lease Sale 58 and express the hope that future environmental statements will use a similar approach in evaluating impact on historic sites and structures.

Sincerely,

Douglas P. Wheeler
Executive Vice President

Enclosures (2)

RESPONSE TO COMMENTS BY THE NATIONAL TRUST FOR HISTORIC PRESERVATION

1. The Advisory Council for Historic Preservation receives copies of all draft and final environmental statements prepared in conjunction with lease sales on the OCS. Advisory Council's comments on lease sales in the Gulf of Mexico OCS have informed us of our responsibilities under the National Historic Preservation Act, E.O. 11593 and the National Environmental Policy Act.

March 3, 1979

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Frank Gregg
Director
Bureau of Land Management
Interior Building
C St. between 18th and 19th, N.W.
Washington, D.C. 20240

Dear Mr. Gregg,

Enclosed are my comments concerning the Draft Environmental Impact Statement prepared for the proposed 1979 Outer Continental Shelf Oil and Gas Lease Sale 58A - Western and Central Gulf of Mexico.

In Figure II-4 (Slumped Sea Floor Sediments), page 26, tracts 1 and 2 border 2 different slumping relms (small slumps on outer edge of Continental Shelf and older slumped sediments underlying undisturbed younger deltaic deposits). Perhaps the withdrawal of these tracts would be in order. If this is not done then all precautions must be taken to assure proper rig and other underwater structure foundations or else possible damage could occur which most likely would be severe. 1.

On page 113 you are using some very old data (1972, 1973, 1974) to describe Texas' petroleum refinery and petrochemical industries. Updating is not only desirable but must be accomplished if the reader is to view the true picture of the condition of Texas' petroleum based industries. 2.

How will the discharge of cuttings and drilling mud effect the benthic community (by burying, increased turbidity, and smouthering) This is never really addressed on page 121. Also how will the drilling in inshore areas affect the communities therein through resuspension of pesticide, heavy metal, or other toxic compounds? 3.

On page 125 how large an area is meant by the statement "... en- 4.

vironmental effects will be extremely localized near the point of discharge. 4.

On page 126 concerning organic compounds other than hydrocarbons which could be biomagnified or accumulated throughout the food chain; the dilution factor would not be critical because of the steady bioaccumulation in the organisms around the platform. Give some examples of some of these compounds which would occur and might bioaccumulate and which are not hydrocarbons. 5.

On page 127, I do not think it can be stated with any certainty that oil and gas produced by this sale will not cause an additive factor on the refinery capacity in the area and support facilities. This seems especially true since as shown on Table II-23 the natural gas drilling in the offshore waters of Texas and Lousiana has increased. 6.

Just because there is a time lag between the lease sale and development (page 128) does not mean that employment from these activities will not burden the existing infrastructure. Local entities often due to lack of money, planning abilities, and knowledge may not plan for such increaes. Quite frequently they are unaware of the problems that are going to occur and have neither the knowhow or expertise to prepare for such stresses on their communities. Also it should be acknowledged that site development of wetlands, bay bottoms, and other fragile area is likely to occur as secondary impacts and can affect the overall vigor of such systems cumulatively. Again on page 140 when discussing this leases impact on wetlands you are not mentioning the cumulative and secondary impacts that will occur from site development. 7.

Concerning the recovery of wetlands from oil spills (page 140), which you say will eventually take place, experience coming from re- 8.

search on the Metula supertanker oil spill and the Bouchard 65 oil barge tanker shows that recovery may take years and in some cases may not occur at all. In fact in the oil spill from the Bouchard 65, Hampson and Moul in the Journal of the Fisheries Research Board of Canada state in their paper entitled *#2 Oil Spill in Bourne, Massachusetts: Immediate Assessment of the Effects on Marine Invertebrates and a 3-Year Study of Growth and Recovery of a Salt Marsh*, that "... the marsh grass in the lower intertidal zone...has shown an inability to reestablish itself by either reseeding or rhizome growth. 8.
The associated sediments show a correspondingly high concentration of petroleum hydrocarbons impregnated in the peat substrate. Erosion rates measured in the affected area, as a result of the 3 year period of marsh degeneration, were 24 times greater than the control site.". There is no way that you have enough data to base your suggestion of no significant effect from long term, low level, chronic oil pollution in marsh areas.

How can you state there will be minimal if any adverse impacts on marine mammals when you have previously stated (page 142) that 9.
there is too little data to assess what impact may occur.

I appreciate this opportunity to comment.

Sincerely,
Brandt Mannchen

Brandt Mannchen
4055 South Braeswood # 303
Houston, Texas 77025

ADDENDUM

Concerning the placement of some tracts near certain important features I have the following comments to make:

Tracts 20, 19, 36, and 37 appear dangerously close to Stetson, Coffee Lump, and the East Flower Garden Banks. I suggest that these be withdrawn. In particular the Flower Gardens are too unique an area to even take the chance that there might be some type of oil spill or accident.

10.

I suggest that tracts 3, 4, 103, 97, 98, and 99 which lie on White Shrimp grounds be withdrawn, that tracts 109, 110, 111, 113, and 114 be withdrawn because they are on Royal Red Shrimp grounds, that tracts 1, 2, 101, 102, 107, and 108 be withdrawn because they are on finfish grounds, and that tracts 7, 23, 35, 40, 46, 48, 54, 69, 70, 77, 78, 83, 90, 94, 96, and 106 be withdrawn because they are on brown shrimp grounds. All of these areas are too valuable to experiment with in the short-term and risk the danger of possibly losing them. The cumulative effects could be large on these areas due not only to possible oil pollution but also to disruption of these animals gathering places. We do not even know which part of the grounds for each species are the most important and valuable and thus could use the most protection. It would make far more sense to wait until this information is in than to take the chance of irrepairably damaging these areas. Our tremendously valuable (both economically and recreationally) commercial and sport fisheries must not be taken so lightly. Once they are destroyed we will not get them back and one more of our options will have disappeared.

Brandt Mannchen

Brandt Mannchen
4055 South Braeswood # 303
Houston, Texas 77025

RESPONSE TO COMMENTS BY MR. BRANDT MANNCHEN

1. Although tract numbers one and two border slump areas, no serious operational problems are expected. Both tracts overlie older, slumped sediments which have not been active for some time. Younger deltaic deposits normally are a problem only when they are not anticipated.

2. The referenced data is somewhat dated. New reference literature has been ordered that should allow the data to be updated.

3. The impacts of the discharge of drilling fluids and cuttings upon benthic ecosystems is discussed in Sec. III, B, No. 4.

4. Environmental studies have indicated that the effects are not measurable greater than 1,000 meters from the discharge point.

5. The referenced chemicals would be short-lived bactericides introduced into the produced water treatment system. No bioaccumulation of these compounds has been documented, nor would any be expected due to the transcience of the compounds.

6. "Additive factor" applies to support facilities only, not refineries.

7. Local entities should coordinate with the CZM program and CEIP funding for local impact aid.

8. The text has been revised.

9. No adverse impacts to marine mammals have been documented.

10. Our fisheries resources are too valuable to be taken lightly. No hard evidence has been produced of damages from marine petroleum operations on fisheries resources. However, from past and present landings, other data, and the long history of oil and gas production offshore Louisiana, fisheries resources and oil and gas production can co-exist.

It does not appear probable that any sport or commercial fishery resource will be irretrievably lost due to this sale.

We do not know which, if any, portions of these animals' ranges are the most important or critical; although, the studies program has attempted to correct this data gap.

If in the future, evidence does become available, the Secretary of the Interior has the option of suspending operations and leases. In view of the many safeguards provided by law, the incremental increase in protection for fisheries does not warrant the loss in petroleum.

Shell Oil Company

One Shell Square
P.O. Box 60124
New Orleans, Louisiana 70160

Offshore [illegible]

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Manager, New Orleans OCS Office
Bureau of Land Management
Hale Boggs Federal Building
Suite 841
500 Camp Street
New Orleans, LA 70130

Gentlemen:

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
PROPOSED OCS SALE 58A

Your letter of January 26, 1979, which transmitted a copy of the DEIS for OCS Sale 58A, invited comments concerning this proposed action. Shell Oil Company previously commented on the DEIS for OCS Sale 58 in Mr. L. G. Otteman's letter of October 30, 1978, to you. Those comments dealt with the sections of the DEIS pertaining to produced formation waters as found on pages III-1, III-4 to -6, and III-31.

In reviewing the DEIS for OCS Sale 58A, we note that language identical to that contained in the DEIS for OCS Sale 58 was again used in those sections dealing with produced formation waters discussed on pages III-121, III-125, III-150, and III-196. We request that the comments made on produced formation waters in our October 30, 1978, letter be incorporated as our comments for the DEIS on OCS Sale 58A.

During the latter part of 1978, static bioassays were conducted as indicated in prior mentioned correspondence using subadult and adult brown shrimp (Penaeus aztecus), subadult and adult white shrimp (Penaeus setiferus), the barnacle (Balanus tintinnabulum), and crested blenny (Hypleurochilus geminatus). We quote from the presentation by Dr. Curt D. Rose, Energy Resources Company, Inc., on December 13, 1978, at the EPA/NOAA Buccaneer Oil Field Study project review in Houston, Texas, regarding results of his studies covering "Crustacean and Fish Bioassays" as follows:

> "Formation water treated with bactericide (acrolein) was relatively nontoxic to subadult and adult brown shrimp, subadult and adult white shrimp, the barnacle, and crested blenny. The lowest 96-hour median lethal concentration (LC_{50}) observed during two static toxicity tests with each species/life-stage combination was 33,000 ppm formation water by volume (0.95 confidence interval = 25,000-38,000 ppm), which

> [illegible]obtained with the barnacle. The highest 96-hour LC_{50}, 408,000 ppm (0.95 confidence interval = 320,000-560,000 ppm), was observed with the crested blenny."

Dr. Rose further commented that:

> "A limiting permissible environmental concentration (LPC) for formation water treated with bactericide was estimated to be 250 ppm (LPC = 25,000 ppm [lower limit of 0.95 confidence interval of the 96-hour LC_{50} for the barnacle] X 0.01 application factor). Maximum environmental concentration of formation water was estimated through use of EPA's release-zone model to be 0.0003 ppm. Comparison of the LPC with the estimated maximum environmental concentration of formation water suggests that discharge of the formation water does not unduly endanger the marine environment."

Additional information on the Buccaneer Oil Field Study testing can be obtained from Dr. C. W. Caillouet, NMFS Project Director.

Yours very truly,

LG Otteman

L. G. Otteman
Division Production Manager

cc: Dr. C. W. Caillouet
National Marine Fisheries Service
Galveston Laboratory
4700 Avenue U
Galveston, TX 77550
(713) 763-1211 Ext. 525

RESPONSE TO COMMENTS BY SHELL OIL CO.

The text has been revised to incorporate the information provided.

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ADDRESS ONLY THE DIRECTOR, FISH AND WILDLIFE SERVICE.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

In Reply Refer To:
FWS/OBS

MAR 16 1979

Memorandum

TO: Director, Bureau of Land Management

FROM: Acting Associate ~~Director,~~ Fish and Wildlife Service

SUBJECT: Review of Draft Environmental Impact Statement for BLM's Proposed OCS Oil and Gas Lease Sale No. 58-A

The following comments on BLM's proposed OCS Lease Sale No. 58-A are provided for your review and processing.

The subject DEIS is generally adequate in its description of the activities associated with this proposed sale. However, you will note that we have reintroduced many of the comments we brought to your attention regarding the DEIS's for Sale Nos. 51 and 58. We request that you not only address these comments in the FEIS for Sale No. 58-A, but also modify future impact statements accordingly.

DESCRIPTION OF THE PROPOSAL

A. Proposed Action

① ✓ Page 8; C. Transportation - It is stated that, "It is anticipated that no new pipelines to facilities onshore will be required." (A similar reference to pipelines is also found on page 128). This assumption may not be true for those tracts proposed for leasing in the southernmost portion of the South Texas OCS area. The cumulative oil and gas developments within those tracts and from previously leased tracts in that area may serve to justify a proposal to construct a new onshore pipeline. We are not aware of any existing onshore pipeline which originates in the South Texas OCS tracts.

ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

A. Basic Assumptions Utilized in the Analysis

② ✓ Page 125; B. Formation Waters - The statement that, "There appears to be no damage caused by the low levels at which these trace elements are present in produced waters, appears to be contradicted by the discussion of trace element presence and their impacts upon phytoplankton (page 134), zooplankton (page 137), nekton (page 137), and benthos (page 139).

② The statement that, "There is an increasing body of evidence indicating that there are natural processes operating to reduce both the concentrations and toxicity of trace metals dissolved in water," should be substantiated through documentation. Furthermore, since the concentrations and toxicity of trace metals dissolved in water will be reduced through dilution, the above sentenke would be more accurate if the word "reduce" was changed to "dilute."

B. Biological Environment

③ Page 134; 1. Phytoplankton - We are aware that turbidity plumes ranging from 1-2 miles have been observed adjacent to exploratory drilling rigs in the Gulf of Mexico. It should also be noted that visual observations of turbidity plumes are restricted to the water surface. The ultimate direction and distances traveled by discharged drilling muds and cuttings would also be dependent on subsurface currents which bear little relation to this surface condition.

④ Page 134; 1. Phytoplankton - If the reduction of photosynthetic assimilation caused by turbidity associated with exploratory development and transportation phases is presently unquantifiable, then it does not appear reasonable to conclude on page 136, that "activities resulting from this proposed sale will have no significance nor lasting impact on phytoplankton."

⑤ Page 136; 1. Phytoplankton - Since the biota in deeper Gulf tracts may differ from the biota in previously leased shallower tracts, the statement that impacts on phytoplankton from future sales is not considered to be significant, seems to be unfounded. This same comment applies to the concluding remarks in this section for zooplankton and benthos.

MITIGATING MEASURES

D. Other Mitigating Measures

⑥ Pages 188-189; Stipulation No. 2 - In view of recent information developed under contract to the New Orleans Office of BLM, regarding OCS topographic features and to provide for adequate environmental protection of sensitive marine ecosystems, we request that BLM consider modifying the limit of the zone of no activity to the 100 meter depth contour around certain deepwater Gulf of Mexico OCS banks including those offered in this sale near the Flower Gardens. In addition, those stipulations, including the above modification, for Tract 58A-115, should be applied to Tract 58A-118.

HIES

A-385

W. L. Old J.

RESPONSES TO COMMENTS BY THE U.S. FISH AND WILDLIFE SERVICE

1. Text has been changed.

2. There is no contradiction. The fact that trace elements may adversely affect certain organisms at high concentrations does not mean that these organisms will be affected by those elements at the concentrations experienced in the field. Dilution is not the only natural process operating to reduce concentration and toxicity; others include adsorption, chelation, precipitation and subsequent settling, and absorption. Some test changes have been made as suggested.

3. The text has been modified. With regard to currents at depth, more extensive discussion will have to await the results of BLM studies currently in progress.

4. The discussion of the impact on phytoplankton points out that certainly some individual phytoplankters will be adversely affected, but when considering the environment as a whole, the impact will be neither significant nor lasting. The key words are "significance" and "lasting".

5. We believe the discussion is satisfactory.

6. The suggestion to modify the area of no activity at the Flower Garden Banks has not been considered by USFWS, USGS, and BLM at meetings held under the auspices of Secretarial Order 2974; the information alluded to is preliminary and still in progress, so it would be prudent to await the final report before making changes to a criterion established during many meetings. Tract 58A-118, which was added to this proposed sale subsequent to the publication of the DEIS, is now covered by an appropriate stipulation.

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ADDRESS ONLY THE DIRECTOR,
FISH AND WILDLIFE SERVICE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

In Reply Refer To:
FWS/OBS

MAR 16 1979

Memorandum

TO: Director, Bureau of Land Management

FROM: Acting Associate Director, Fish and Wildlife Service

SUBJECT: Review of Draft Environmental Impact Statement for BLM's Proposed OCS Oil and Gas Lease Sale No. 58-A

The following comments on BLM's proposed OCS Lease Sale No. 58-A are provided for your review and processing.

The subject DEIS is generally adequate in its description of the activities associated with this proposed sale. However, you will note that we have reintroduced many of the comments we brought to your attention regarding the DEIS's for Sale Nos. 51 and 58. We request that you not only address these comments in the FEIS for Sale No. 58-A, but also modify future impact statements accordingly.

DESCRIPTION OF THE PROPOSAL

A. Proposed Action

Page 8: C. Transportation - It is stated that, "It is anticipated that no new pipelines to facilities onshore will be required." (A similar reference to pipelines is also found on page 128). This assumption may not be true for those tracts proposed for leasing in the southernmost portion of the South Texas OCS area. The cumulative oil and gas developments within those tracts and from previously leased tracts in that area may serve to justify a proposal to construct a new onshore pipeline. We are not aware of any existing onshore pipeline which originates in the South Texas OCS tracts.

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The statement that, "There is an increasing body of evidence indicating that there are natural processes operating to reduce both the concentrations and toxicity of trace metals dissolved in water," should be substantiated through documentation. Furthermore, since the concentrations and toxicity of trace metals dissolved in water will be reduced through dilution, the above sentence would be more accurate if the word "reduce" was changed to "dilute."

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MITIGATING MEASURES

D. Other Mitigating Measures

Pages 188-189; Stipulation No. 2 - In view of recent information developed under contract to the New Orleans Office of BLM, regarding OCS topographic features and to provide for adequate environmental protection of sensitive marine ecosystems, we request that BLM consider modifying the limit of the zone of no activity to the 100 meter depth contour around certain deepwater Gulf of Mexico OCS banks including those offered in this sale near the Flower Gardens. In addition, those stipulations, including the above modification, for Tract 58A-115, should be applied to Tract 58A-118.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

23 MAR 1979

Jesse —
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RECEIVED
OFFICE OF THE ADMINISTRATOR
MAR 23 1979

Mr. Frank Gregg, Director
Bureau of Land Management
Department of the Interior
Washington, D.C. 20240

OFFICE OF THE DIRECTOR
BUREAU OF LAND MANAGEMENT

Dear Mr. Gregg:

The Environmental Protection Agency (EPA), in accordance with its responsibilities under the National Environmental Policy Act and Section 309 of the Clean Air Act, has reviewed the draft Environmental Impact Statement (EIS) on the Proposed 1979 Outer Continental Shelf Oil and Gas Lease Sale - Western and Central Gulf of Mexico (OCS #58A).

This action involves the proposed sale of 115 leases for tracts offshore Texas, Louisiana, Mississippi, and Alabama. Our review of the EIS on this proposal generally indicates a lack of environmental objections regarding the offering of 105 of the 115 lease tracts. However, we view as environmentally unacceptable the offering, as currently proposed, of 10 tracts.

Lease sale #58A contains six tracts (109, 110, 111, 112, 113, 114) which EPA defines as being in deep water (depths greater than 300 meters). As you know, EPA has consistently objected to the offering of such tracts which may necessitate the use of unregulated technology. While we believe this problem may be partially mitigated by the USGS's proposed Platform Structural Verification Program, the issue of subsea systems remains unresolved in our view (see our enclosed comments to USGS, March 13, 1979). This issue has been raised a number of times, especially regarding the point at which developmental scenarios and special conditions would tend to favor the use of subsea systems over platform technology. It is clear that the particular development mode (surface or subsea) cannot be predicted at the

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time of the lease sale, and that leases may be sold where subsea technology may be later determined to be the desired development option. EPA continues to assert that existing operational controls pertain only to platform operation and cannot be construed to apply to new subsea systems. Thus, we believe that it is improper to sell leases that may later necessitate or encourage the use of subsea technology. Again, we urge that BLM consult with the Geological Survey to accomplish the preparation of 1) a programmatic EIS on deepwater leasing and development, and 2) a full set of Deepwater Operating Orders to regulate this technology. EPA recommends no further deepwater tracts be offered in the meantime. We believe this course to be less onerous than the possibility of later delays in EPA National Pollutant Discharge Elimination System (NPDES) permitting activities in the absence of such information and controls.

② In addition, BLM proposes to offer four lease tracts that are adjacent to biologically sensitive reef or hard bank areas. We recommend that tract #115 near the East Flower Garden Bank be deleted from the sale, pursuant to our past discussions on measures necessary to protect this unique area that is soon to be designated as a Marine Sanctuary. With regard to tracts #20, 37, and 89 that are respectively near Stetson Bank, Bright Bank and an unnamed bank in Block 317 of the South Timbalier Area, South Extension, we recommend the following modification to the proposed protective stipulation: both shunting and monitoring should be required on these lease tracts, and the monitoring program should be designed in consultation with EPA, the National Oceanic and Atmospheric Administration and the Fish and Wildlife Service.

Thank you for the opportunity to comment on this statement. We hope our comments will assist in the preparation of the final statement.

Sincerely,

William N. Hedeman, Jr., Director
Office of Federal Activities (A-104)

Enclosure

RESPONSES TO COMMENTS BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY

1. We have added a new subpart d under Section III.A.1. titled Platforms and Structures in which we specifically address deepwater technology and associated regulations. A deletion alternative involving deepwater tracts has also been added to Section VIII.A.

2. Five tracts are near biologically sensitive areas. One, tract 58A-118, near the West Flower Garden Bank, was added to this proposed sale subsequent to the publication of the DEIS. An appropriate stipulation will be a part of the lease document for that block should it be leased in this proposed sale (See Section IV.D.7.).

As we have previously stated, the preponderence of the evidence, based on studies conducted by BLM and others, and the results of which we have provided EPA, strongly indicates that the restrictive measures imposed by the lease stipulations discussed in Section IV.D.7. are adequate to protect the living resources of these sensitive areas. These measures have been developed over the past few years by BLM in close consultation with USGS, USFWS, and recognized expert reef ecologists; and using the results of various studies at a number of banks, including the Flower Gardens, which failed to detect any adverse impact to the biota of such banks from oil and gas industry activities when measures such as those of Stipulation 2 are imposed.

The Department of the Interior has not yet reviewed the draft environmental statement for the proposed Flower Garden Marine Sanctuary; however, in its comments on NOAA's White Paper concerning the sanctuary designation, the Department addressed both the size of the sanctuary and appropriate regulations. The existing and proposed stipulations prohibit oil and gas activities within the 85 meter isobath, which defines the base of each bank. The Department's comments concluded that this area" would be sufficient also to establish control over other uses which would be potentially harmful to the banks". Reiterating what we have stated above, the comments also indicate that,

> ...we have established a buffer zone around the reefs in which oil and gas operational restrictions and monitoring requirements are strictly imposed. Monitoring studies are required within this buffer zone to assess the "health" of the reefal communities and, if any adverse effects from oil and gas operations are noted, operations could be suspended immediately. The results of these studies have shown no adverse effect on the reefal communities from nearby development activities.

Therefore, BLM does not believe that leasing the proposed tracts, with the stipulations included in Section IV, would have an adverse impact on the coral communities, nor does it believe that such leasing would be inconsistent with protection of the banks through designation of sanctuary status, which the Department supports.

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230
(202) 377 4335

March 29, 1979

Manager
New Orleans OCS Office , BLM
Hale Boggs Federal Building
500 Camp Street
New Orleans, Louisiana 70130

Dear Sir:

The Department of Commerce reviewed the draft environmental statement by the Department of Interior relative to "Outer Continental Shelf Oil and Gas Lease Sale (OCS Sale No. 58A), Gulf of Mexico," and forwarded comments to you in our letter of March 26, 1979.

Since that time, additional information has developed which is pertinent to the project. This additional information from the National Oceanic and Atmospheric Administration is enclosed for your consideration.

We are pleased to have been offered the opportunity to review this statement.

Sincerely,

Sidney R. Galler

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

Enclosure from: Mr. Robert Kifer
Office of Coastal Zone
Management

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
~~Rockville, Maryland 20852~~

Office of Coastal Zone Management
3300 Whitehaven Street, N.W.
Washington, D.C. 20235

DATE: March 27, 1979

TO: A/PP - Richard L. Lehman

THRU: CZ - Robert W. Knecht Samuel A. Bleicher for

FROM: CZx4 - Robert Kifer Robert R Kifer

SUBJECT: Request for Comments on DEIS for Proposed OCS Lease Sale No.58A

This is in response to a request for comments on the Draft Environmental Impact Statement for proposed OCS Lease Sale No. 58A, offshore of the States of Texas, Louisiana, Mississippi and Alabama. In the proposed sale, High Island Area--Block No. A-374 is being reoffered for leasing. This tract includes a portion of the East Flower Garden Bank, part of a unique coral reef ecosystem which the National Oceanic and Atmospheric Administration (NOAA) is proposing to designate as a marine sanctuary. Because of this, and based on the following rationale, we recommend that this tract be withdrawn from the sale pending further environmental study.

BACKGROUND

The Office of Coastal Zone Management, Sanctuary Programs Office, has been analyzing the proposal to designate the Flower Garden Banks as a marine sanctuary for more than a year. We issued a white paper (June, 1978) on the proposal to designate the Banks as a marine Sanctuary. Based on the comments received in response to the white paper, we decided to proceed with designation of the sanctuary. To this end, we have been designing a proposed regulatory framework to govern activities taking place within a possible sanctuary. We are in the process of completing a draft environmental impact statement on the proposed sanctuary including its boundaries and regulations. A copy of the Summary from the EIS is attached. We expect the Secretary of Commerce to seek Presidental approval to designate the sanctuary in early fall of this year, late FY 79.

COMMENTS ON PROPOSED OCS OIL AND GAS LEASE SALE #58A

Inclusion in the Sale of High Island Block A-374

Block A-374 includes a significant part of the east flank of the East Flower Garden Bank. If oil and gas operations take place on this tract, they would be very close to the coral reef and hard bank biological communities NOAA is seeking to protect. We have reviewed and analyzed the special stipulation that would apply to the tract if it is leased and we find that, in the absence of more data, it is impossible to insure that the reefs and hard bank biota will not be harmed by oil and gas operations. Also we are not certain that this tract will bring significant interest, if offered again, as evidenced by the receipt of insufficient bids at a previous sale.

Additional Environmental Study

NOAA, in conjunction with the Environmental Protection Agency (EPA) is proposing that a 5-year moratorium be placed on all new leasing and the issuance of National Pollutant Discharge Elimination System (NPDES) Permits for the area within the marine sanctuary. This moratorium would allow NOAA and EPA to conduct environmental studies to determine whether or not the impacts from oil and gas operations will have serious long term effects on the Banks' communities. At the conclusion of this five-year period, the need for restrictions on oil and gas operations to preserve the reef will be reassessed.

The proposed marine sanctuary regulation that would establish the moratorium and the other regulations, as they will appear in the Federal Register, are attached.

SPECIFIC COMMENTS ON THE SALE 58A DEIS

The Sanctuary Programs Office has reviewed the DEIS and offers the following comments.

I.C.3 Estuarine and Marine Sanctuaries. (P. 16). This section should be rewritten to reflect the reduced boundary proposal of 4 nm from the 100 m isobath, an area of approximately 225 square miles. The "activities to be regulated" should be changed as follows:

(1) Removing, breaking or otherwise deliberately harming coral bottom formations or marine invertebrates or plants, or taking tropical fish, except incidentally to other fishing operations.

(2) Operations of vessels other than fishing vessels, including anchoring and navigation, and anchoring by fishing vessels.

(3) Dredging, or altering the sea bed in any manner.

(4) Construction.

(5) Discharging or depositing any substance or object.

(6) Using poisons, electric charges, spearguns or explosives.

(7) Trawling or dragging bottom gear within the 100 m isobath.

II.B.10. Biologically Sensitive Area. (PP. 64-66). No Additions.

III.B.7. Biologically Sensitive Areas. (PP. 140-141). Should add the summary of how BLM stipulations would compare with the proposed marine sanctuary regulations and EPA proposed NPDES permit condition.

IV.D.6. Requirements of Other Federal Agencies. (PP. 185-186). Should be written to reflect EPA's latest proposed NPDES permit conditions and NOAA's marine sanctuary proposal as stated herein.

IV.D.7. Special Stipulations. (PP. 186-189). No additions.

VIII.A.1. Withdraws Tract 115. (HI A-374) (p. 209). Update to reflect information transmitted herein.

In conclusion we are pleased that the withdrawal of High Island Block A-374 on the east bank of the East Flower Garden Bank is presented as an alternative. For the reasons specified herein, we suggest most strongly that this one tract be withdrawn pending the results of the proposal to designate the Flower Garden Banks as a marine sanctuary and the results of the proposed joint NOAA/EPA environmental studies that would take place during the 5-year moratorium.

We appreciate this opportunity to comment.

Enclosures

SUMMARY

Introduction

The Marine Protection, Research and Sanctuaries Act of 1972 (Public Law 92-532) authorizes the Secretary of Commerce with Presidential approval to designate ocean areas with distinctive conservation, recreational, ecological, or aesthetic values as marine sanctuaries. The Flower Garden Banks, lying more than one hundred miles offshore Texas and Louisiana in the Gulf of Mexico, have been nominated as a candidate site for marine sanctuary designation by Texas State Senator A. R. Schwartz in conjunction with the Texas Coastal and Marine Council. The Banks are biologically unique and important. They contain the northwestern most living coral reefs on the Gulf of Mexico Outer Continental Shelf, and are, thus, the only truly tropical coral reefs in the northwestern Gulf. The live reef contains 18 coral species, more than 100 species of caribbean reef fish, and more than 200 invertebrate species.

For more than a year The Office of Coastal Zone Management (OCZM), of the National Oceanic and Atmospheric Administration (NOAA), in the Department of Commerce has been studying the Banks and the proposal to designate the area as a marine sanctuary. In order to determine the desirability and feasibility of proceeding with the designation, NOAA has gathered and analyzed information and consulted with other Federal agencies, State governments and local interest groups. A White Paper outlining a tentative proposal for public review was prepared and issued in June 1978. Based on public responses to the White Paper and the input of many interested parties, NOAA proceeded with this environmental assessment in accordance with the National Environmental Policy Act of 1969 (NEPA).

NOAA's environmental assessment provides the basis for this draft environmental impact statement (DEIS) which describes the proposed action to designate the sanctuary including draft regulations on activities and uses. Within NOAA, the Office of Coastal Zone Management (OCZM) has lead agency responsibility for administration and implementation of the marine sanctuary program. OCZM has reviewed numerous options for both designation and presents the proposed action described in this DEIS as the preferred alternative. (See Chapter F.)

The preferred alternative does not represent a final decision; it is presented and evaluated in this DEIS for public review. NOAA will receive comments on this DEIS, hold public hearings in Galveston, Texas, and Lake Charles, Louisiana, and respond to all comments received. After review of comments and final consultation with Federal agencies, if a decision is made to proceed with the designation, NOAA must seek Presidential approval of the proposed marine sanctuary designation.

A draft Designation document and a set of draft proposed regulations appear at the end of this summary. These documents describe the preferred alternative and will be published in identical form in the FEDERAL REGISTER concurrently with the distribution of this DEIS. The comment period will be open for sixty days after which, if a sanctuary is to be designated, final regulations will be published in the FEDERAL REGISTER including responses to comments received.

Proposal To Designate the Flower Garden Banks Marine Sanctuary

The Office of Coastal Zone Management proposes to designate the Flower Garden Banks as a marine sanctuary and to manage the area through a set of regulations. The sanctuary proposed includes an area in the Gulf of Mexico located approximately 110 nautical miles (nm) southeast of Galveston, Texas, and 120 nm south of Cameron, Louisiana.

The area proposed for sanctuary designation includes the waters over the following:

East Flower Garden Bank, the topographic structure in the Gulf of Mexico with approximate center point of 27° 55' 07.44" N and 93° 36'08.49"W.

West Flower Garden Bank, the topographic structure in the Gulf of Mexico with approximate center point at 27° 52' 14.21" N and 93° 48' 54.79" W.

The proposed area of the Flower Garden Banks Marine Sanctuary is the space enclosed by a continuous line four nautical miles from the 100-meter isobaths of each Bank except that the boundary has been modified not to intrude on the shipping safety fairway south of the West Flower Garden Bank. (See Figure C-1). The exact boundary by coordinates is presented following this summary in Appendix B to the proposed regulations. For navigation and most other purposes this boundary can be approximated by circular arcs at all points four nautical miles from the 50 fathom (100 meter; 330 feet) isobath except south of the West Flower Garden Bank where the circular boundary is truncated by the Gulf Shipping Safety Fairway which runs in an east-west direction approximately six miles from the Bank's mid-point.

The sanctuary will include an area of about 175 square nautical miles. The proposed sanctuary boundary reflects the size of the area within which regulation is necessary to protect the resources of the Banks.

Designation

A Designation document, the draft of which is presented after this summary, will establish the boundary of the sanctuary, the purposes of the sanctuary, identify the types of activities that may be subject to regulation under the Marine Sanctuaries Act, and specify the extent to which other regulatory programs will continue to be effective within the sanctuary. The Designation requires the approval of the President. Its content can be altered only after repeating the entire designation process and securing Presidential approval.

The Designation presented in this DEIS identifies the proposed sanctuary as the area within 4 nautical miles of the 100-meter isobath around each bank and also identifies the following activities as subject to regulation:

- deliberate damage or harm to corals and marine invertebrates;
- operations of vessels other than fishing vessels and anchoring by all vessels;
- dredging or altering the sea bed;
- construction;
- discharging or depositing any substance;
- using poisons, explosives, electric charges or spearguns;
- trawling within the 100 m isobaths of the Banks; and
- oil and gas operations.

Regulations have been considered for all of these activities; however, in some cases, such as spearfishing and vessel navigation, no regulations are proposed at this time. By listing these activities in the Designation, NOAA reserves the ability to propose regulation of these activities in the future, without obtaining Presidential approval of an amendment, if threats to the resources increase.

Management

Management of the Marine Sanctuary will be designed to preserve the coral reef and other bank ecosystems in their natural state. By integrating education, environmental monitoring, and compatible use regulations into a coordinated management strategy, NOAA will insure that the public can derive maximum benefit from the Marine Sanctuary with a minimum of environmental damage. A detailed management plan will be developed following designation of the sanctuary.

Enforcement and surveillance will be an integral part of the management and protection of the Flower Garden Banks. NOAA is exploring various means of providing enforcement and surveillance. The participation of any enforcement agent will be the subject of continuing discussions and will be affected by the precise scope and content of the final regulations, as well as by other demands and priorities facing NOAA and the other agencies involved.

Proposed Regulations

In this DEIS, NOAA presents, reviews and analyzes the environmental and economic impacts of a preferred alternative marine sanctuary designation with certain boundaries and certain regulations. These regulations will apply within the sanctuary boundaries and will implement the terms of the Designation. Only if an activity is listed in the Designation will it be subject to regulation. If an activity is listed and not regulated, such as spearfishing and vessel navigation, NOAA has determined that while the activity has the significant potential to harm the resources of the Flower Garden Banks, no immediate restriction is appropriate because certain data are unavailable or because NOAA believes coordination with other agencies or other non-regulatory approaches should be attempted first.

The preferred alternative, presented in detail in Section F and summarized here, includes a set of regulations dealing with the activities listed in the Designation. The exact text of the proposed regulations as they will appear in the FEDERAL REGISTER is presented following this summary.

The regulations proposed in the preferred alternative include the following controls:

- Taking, disturbance, or harm to corals and marine invertebrates.

The major purpose for designation of the sanctuary is protection of the ecosystems of the Flower Garden Banks, particularly their unique coral reef caps. Accordingly, the proposed regulation prohibits taking, disturbing or harming corals and other marine invertebrates. All corals, living and non-living will be protected. The only items not subject to this regulation are the shells of dead invertebrates.

- Operation of vessels other than fishing vessels and anchoring of all vessels.

The anchoring regulations address both commercial and recreational boat anchoring. Under the regulations, commercial ships and oil industry supply vessels will be prohibited from anchoring within the 100 m isobaths of the Banks. This prohibition will protect the reefs and their ecosystems from the severe physical impacts caused by anchoring.

Anchoring by commercial vessels will be prohibited to the extent consistent with international law. Anchoring by recreation boats and recreational charter boats will be allowed, but anchoring on corals or coral heads or in such a manner as to damage any coral formation is to be avoided. For dive boat operations, the first divers down will inspect the anchor to insure it is properly set before diving can continue. These anchoring regulations will ensure that there is no direct anchor damage to corals and will prevent chains, wires, and shifting anchors from abrading the reefs.

- Dredging or altering the sea bed.
- Construction.

No dredging or other alteration of the seabed is allowed within the 100 m isobath. Pipeline placement, platform placement, construction or mooring of construction equipment will not be allowed within this zone. This prohibition will insure that no mechanical damage is done to any of the biologic zones at the Banks including the crinoid zone which occurs at the 100 m isobath.

° Discharging or depositing any substance.

With the exception of regulated discharges of drilling muds and cuttings specified below, any discharge in the sanctuary, including oily waste, will be prohibited. Further exceptions are granted for effluents from marine sanitation devices, cooling water effluents from ocean vessels, fish cleaning wastes, and chumming materials. Discharges from vessels within the sanctuary will be prohibited to the extent consistent with international law.

° Use of poisons, explosives, electric charges or spearguns.

The use of poisons, explosives, and electric charges would be inconsistent with the purposes of the sanctuary and the proposal prohibits their use. While the present level of spearfishing at the Banks does not appear to be affecting the biological resources, the lack of definite evidence on this point and the possibility of increases in the activity resulting in harm have prompted inclusion of spearfishing as an activity that may be subject to regulation in the future. Study of spearfishing in heavily used areas, such as the Key Largo Marine Sanctuary, has revealed that it causes some alteration of the ecosystem. If the level of spearfishing increases rapidly at the Flower Garden Banks, NOAA will be able to respond by proposing regulations, authorized under the terms of the Designation.

° Trawling within the 100 m isobaths of the Banks.

Regulation of both commercial and recreational fishing in the waters proposed for designation of the Flower Garden Banks Marine Sanctuary is the responsibility of the Gulf of Mexico Regional Fishery Management Council and the National Marine Fisheries Service pursuant to the Fishery Conservation and Management Act of 1976 (P.L. 94-265). No additional regulation by OCZM except a prohibition on bottom trawling within the 100-meter isobath is being proposed under the preferred alternative. Bottom trawling could be devastating to the coral reefs and is therefore prohibited.

° Oil and gas operations.

Oil and gas activities would be regulated in several specific ways.

For leases awarded prior to the effective date of the regulations, the following controls will apply:

-- A no-activity zone will be established which includes the area defined as a no-activity zone under the BLM stipulation (see Appendix A to the regulations) plus the area outside the BLM zone but inside the 100 m isobaths of the Banks. Within the no-activity zone drilling, dredging, mooring, construction, platform placement or any other like activity will be prohibited. The regulation is necessary for the protection of the coral reefs and hard bank biological communities.

-- Within the sanctuary boundary, which is 4 nautical miles from the 100 m isobaths, and outside the no-activity zone:

- Surface discharges of drill cuttings and adherent muds will be prohibited and shunting these materials to within 6-meters of the bottom will be required. This will provide some assurance that these materials will be deposited in the nepheloid layer;
- Monitoring of these discharges will be required once before, frequently during and once after drilling. Because experience with drilling near the Banks is limited and because scientific questions still remain about the effects of drilling muds on marine organisms, monitoring is necessary to insure that allowable discharges are not affecting the reefs;
- Discharges of drilling muds in bulk will be prohibited. This will insure that large amounts of muds are not released to the environment in a short time; and
- The simultaneous discharge of effluents from more than one well on a single rig or platform will be prohibited. Like the prohibition on bulk discharging, this regulation will prevent concentrated release of volumes of sediment to the environment.

In addition to these specific regulations dealing with individual drilling activities, the regulations will also require that the operator possess a valid and final National Pollutant Discharge Elimination System (NPDES) permit from the Environmental Protection Agency and any and all other permits that may be required by other Federal agencies.

-- A moratorium will be placed on all oil and gas activities on leases awarded after the effective date of the regulations. The moratorium will have a duration of 5 years from this date, during which time environmental studies performed by NOAA, EPA, other Federal agencies and the oil and gas industry under a monitoring program will help resolve unanswered questions concerning the effects of oil and gas development on the reef ecosystem. At the conclusion of this 5-year period the need for restrictions of oil and gas operations to preserve the reef will be reassessed.

Environmental Consequences of the Proposed Action

Designation of the Flower Garden Banks Marine Sanctuary and implementation of the proposed regulatory framework will benefit the biological resources of the Banks and will affect the socio-economic environment of the area. The environmental consequences of the designation, as well as the environmental consequences of other alternatives that were considered, are presented in Part F. The additional costs upon those ocean users affected by the regulations also are discussed in Part F as part of the environmental analysis.

The environmental and socio-economic consequences can be summarized as follows:

- Environmental protection. Sanctuary designation will afford a higher level of protection to the Banks' ecosystems than currently exists under other Federal authorities. Protection of corals from anchoring, trawling and other physical damage will be provided where no such protection now exists. Discharges of oily and other wastes from vessels, within the limitations of international law, will be prohibited, providing greater protection than presently.
  Oil and gas operations will be subject to stricter controls than those currently in place. Additional protection is provided by prohibiting use of poisons, electric charges, and explosives which could be devastating to the ecosystems.

- Inconvenience to recreational users. Some recreationists will be slightly inconvenienced because they will be required to follow proper anchoring procedures .
- Inconvenience to commercial vessel traffic. Some commerical vessels may be slightly inconvenienced since they cannot discharge any waste materials within the sanctuary.
- Inconvenience to commercial fishermen. Since it has been determined that bottom trawling is not now a practice at the Banks, it is doubtful that the prohibition on bottom trawling within the no-activity zone will cause any impacts to fishermen.
- Additional costs to oil and gas operators. The proposed action will impose some costs on oil and gas operators. The five-year moratorium on oil and gas activities seems likely to render future proposed oil and gas leases within the sanctuary undesirable to prospective bidders. This does not represent an irreversible or irretrievable loss, however, since the resource will be available if, and when the moratorium is eventually lifted and the capital which would have been invested can be productively employed in other leases in the interim period. The BLM presently requires shunting on some tracts within the proposed sanctuary, although not to the depth proposed in the regulations. The sanctuary shunting requirement will add slight additional costs to those operations already subject to the BLM shunting requirement. It will add approximately $50,000 to $82,000 per platform to the costs of those operators which are not now required to shunt. The monitoring requirement will add $300,000 to $500,000 per well to

the cost of drilling in those areas where monitoring is not now required by BLM, i.e., outside a line 1 nm from the 85-meter isobath and within the sanctuary. This is the single largest expense to be incurred as a result of the designation of the sanctuary. The prohibitions on bulk discharges and simultaneous discharges from more than one well from a rig or platform are expected to add only minor costs to operations. It is normal industry practice, for instance, to drill one well at a time from a single rig. Many of these expenses might have been incurred in compliance with the NPDES and other Federal agency permit conditions which must be obtained regardless of whether the area is designated a marine sanctuary. Thus, these are maximum cost estimates.

The overall environmental effect of sanctuary designation should be protection of the unique reefal communities with minimum interference to users of the Banks. As mentioned, a detailed treatment of environmental and economic consequences is presented in Part F.

Marine Sanctuary Permits

Marine sanctuary permits, issued by NOAA, will be required for any activity which would otherwise violate the regulations and may be granted only if the activity will serve research or educational purposes or is related to salvage operations. The permit procedure is specified in the regulations.

Certification of Other Permits

The regulations propose to certify in advance any permit, license or other authorization to act within the sanctuary as long as the activity does not violate marine sanctuary regulations. This notice of validity avoids duplicating permit delays and costs where there is no violation.

NOAA-EPA Agreement

NOAA and EPA, which has authority under the Federal Water Pollution Control Act to regulate discharges in ocean waters, have reached an agreement dealing with discharges from oil and gas operations. Under this agreement the NPDES permit conditions and the proposed sanctuary regulations will correspond to the maximum extent practicable.

In addition to the correspondence of sanctuary regulations and NPDES permit conditions, EPA will issue no NPDES permits for discharges from operations in any lease awarded after the effective date of the marine sanctuary regulations. This moratorium will correspond to the NOAA proposed moratorium on all oil and gas activity within the sanctuary in any lease awarded after that date.

Additionally, NOAA and EPA have agreed to pursue development and implementation of a research and monitoring program during the moratorium period. This program will focus on determining the effects of oil and gas operations on the Flower Garden Banks' ecosystems to insure that the marine sanctuary regulations and the NPDES permit conditions are properly attuned to environmental protection needs. At the conclusion of the five year moratorium, the extent and scope of regulation of oil and gas operations will be reassessed and modified regulations will be proposed as needed.

Alternatives to the Proposed Action

The alternative regulations which were considered in addition to the proposed regulations are presented in Part F.

Text of the DEIS

The proposed Designation and regulations, with appendices, appear immediately after this summary, followed by the full environmental impact analysis.

TITLE 15 - COMMERCE AND FOREIGN TRADE

CHAPTER IX - NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

PART 934 - FLOWER GARDEN BANKS MARINE SANCTUARY

AGENCY: National Oceanic and Atmospheric Administration (NOAA), Department of Commerce

ACTION: Proposed Rule

SUMMARY: These regulations define permissible activities within the Flower Garden Banks Marine Sanctuary, the procedures by which persons may obtain permits for prohibited activities, and the penalties for committing prohibited acts without a permit.

DATE: Comments due 60 days after publication in the Federal Register

ADDRESS: Send Comments to: Director, Sanctuary Programs Office, Office of Coastal Zone Management, NOAA, 3300 Whitehaven Street, N.W., Washington, D.C. 20235.

PERSON TO CONTACT FOR FURTHER INFORMATION: JoAnn Chandler, Acting Director, Sanctuary Programs Office, Office of Coastal Zone Management, NOAA, 3300 Whitehaven St. N.W., Washington, D.C. 20235. 202-634-4236.

SUPPLEMENTARY INFORMATION:

Title III of the Marine Protection, Research, and Sanctuaries Act of 1972, 16 U.S.C. 1431-1434 (the Act) authorizes the Secretary of Commerce, with Presidential approval, to designate ocean waters as far seaward as the outer edge of the Continental Shelf as marine sanctuaries to preserve or restore distinctive conservation, recreational, ecological, or aesthetic values. Section 302(f) of the Act directs the Secretary to issue necessary and reasonable regulations to control any activities permitted within a designated marine sanctuary. The authority of the Secretary to administer the provisions of the Act has been delegated to the Assistant Administrator for Coastal Zone Management within the National Oceanic and Atmospheric Administration, U.S. Department of Commerce (the Assistant Administrator).

The Office of Coastal Zone Management is proposing to designate as a marine sanctuary an area of the Gulf of Mexico known as the East and West Flower Garden Banks located approximately 110 nautical miles (nm) southeast of Galveston, Texas and 120 nm south of Cameron, Louisana. The proposed sanctuary would include the waters overlaying the banks and extending to within 4 nm of the 100 m (328 ft.) isobaths of each bank, a total area of approximately 173.25 square nautical miles.

The Banks are biologically unique and important. They contain the northernmost living coral reefs on the U.S. Continental Shelf, the only truly tropical coral reefs in the northwestern Gulf of Mexico. The live banks contain some 18 coral species; the ecosystem supports more than 100 species of caribbean reef fish and more than 200 species of invertebrates.

Since the nomination of the Banks as a Sanctuary, over a year ago, NOAA has been studying the Banks and the proposal to determine the desirability and feasibility of designation. After gathering and analyzing information and consulting with other Federal agencies, the Gulf Regional Fishery Management Council, State and local governments and interest groups, a White Paper was prepared and issued in June 1978 outlining a tentative proposal for public review. Based on the responses to this White Paper, NOAA prepared a draft environmental impact (DEIS) which is being published concurrently with these regulations. (A copy can be obtained by writing to the contact identified above).

The rationale for designation and for the proposed regulatory system as well as alternative approaches, both regulatory and non-regulatory are more fully set forth in the DEIS. OCZM will receive public comments on the proposal, hold public hearings in Galveston, Texas, and Lake Charles, Louisana and prepare a final EIS and regulations which incorporate and respond to these comments received. Only after final consultation with Federal agencies, and with Presidential approval, can the Secretary designate the sanctuary and promulgate the regulations.

NOAA policy and its proposed General Marine Sanctuary Regulations (44 FR 6930) provide that the regulatory system for a marine sanctuary will be established by two documents, a Designation document and the regulations issued pursuant to Section 302(f) of the Act.

The Designation will serve as a constitution for the sanctuary, establishing among other things the purposes of the sanctuary, the types of activities that may be subject to regulation within it and the extent to which other regulatory programs will continue to be effective. As proposed, the Flower Gardens Designation document would provide as follows:

Draft Designation Document

Designation Of The Flower Garden Banks Marine Sanctuary

Preamble

Under the authority of the Marine Protection, Research and Sanctuaries Act of 1972, P.L. 92-532, (the Act) the Flower Garden Banks are hereby designated a Marine Sanctuary for the purposes of preserving and protecting this unique and fragile ecological community.

Article 1. Effect of Designation

Within the area designated as the Flower Garden Banks Marine Sanctuary (the Sanctuary), described in Article 2, the Act authorizes the promulgation of such regulations as are reasonable and necessary to protect the values of the Sanctuary. Article 4 of the Designation lists those activities which may require regulation but the listing of any activity does not by itself prohibit or restrict it. Restrictions or prohibitions may be accomplished only through regulation and additional activities may be regulated only by amending Article 4.

Article 2. Description of the Area

The Sanctuary consists of an area of the Gulf of Mexico of 173.25 square nautical mile (nm2) located approximately 110 nm southeast of Galveston, Texas, and 120 nm south of Cameron, Louisiana, overlaying the East and West Flower Garden Banks, the approximate midpoints of which are respectively, 27°55'07.44"N; 93°36'08.49"W. and 27°52'14.21"N; 93°48'54.79"W and extending to the waters within 4 nm of the 100 m. (328 ft.) isobaths surrounding the Banks. The precise boundaries are defined by regulation.

Article 3. Characteristics of the Area That Give it Particular Value

The Flower Garden Banks contain the northwestern most coral reef ecosystems in the Gulf of Mexico with hundreds of species of marine organisms, including at least 18 species of Caribbean corals and diverse tropical faunal and floral communities. The Banks provide exceptional recreational experiences and scientific research opportunities and generally have unique value as an ecological, recreational, and esthetic resource.

Article 4. Scope of Regulation

Section 1. Activities Subject to Regulation. In order to protect the distinctive values of the Flower Garden Banks, the following activities may be regulated within the Sanctuary to the extent necessary to ensure the protection and preservation of the coral and other marine features and the ecological, recreational, and esthetic value of the area:

a. Removing, breaking or otherwise deliberately harming coral, bottom formations or marine invertebrates or plants, or taking tropical fish, except incidentally to other fishing operations.

b. Operations of vessels other than fishing vessels, including anchoring and navigation, and anchoring by fishing vessels.

d. Dredging, or altering the seabed in any manner.

d. Construction

e. Discharging or depositing any substance or object.

f. Using poisons, electric charges, spearguns or explosives.

g. Trawling or dragging bottom gear within the 100 m (328 ft.) isobaths.

Section 2. Consistency with International Law. The regulations governing the activities listed in Section 4 of this Article will be applied to foreign flag vessels and persons not citizens of the United States only to the extent consistent with recognized principles of international law or as otherwise authorized by international agreement.

Section 3 Emergency Regulations. Where essential to prevent immediate, serious and irreversible damage to the ecosystem of the Banks, activities other than those listed in Section 1 may be regulated within the limits of the Act on an emergency basis for an interim period not to exceed 120 days, during which an appropriate amendment of this Article would be proposed in accordance with the procedures specified in Article 6.

Article 5. Relation to Other Regulatory Programs

Section 1. Fishing. The regulation of fishing is not authorized under Article 4 except with respect to the removal or deliberate damage of distinctive features (paragraph (a)), the use of certain techniques (paragraph (f)), or trawling on the banks (paragraph (g)). In addition, fishing vessels may be regulated with respect to discharges (paragraph (e)) and anchoring (paragraph (b)). All regulatory programs pertaining to fishing, including particularly Fishery Management Plans promulgated under the Fishery Conservation and Management Act of 1976, 16 U.S.C. 1801 et seq. shall remain in effect and all permits, licenses and other authorizations issued pursuant thereto shall be valid within the Sanctuary unless inconsistent with any regulation implementing Article 4.

Section 2. Defense Activities. The regulation of those activities listed in Article 4 shall not prohibit any activity conducted by the Department of Defense that is essential for national defense in times of war or other national emergency. Such activities shall be conducted consistently with such regulation to the maximum extent practicable. All other activities of the Department of Defense are subject to Article 4.

Section 3. Other Programs. All applicable regulatory programs shall remain in effect and all permits, licenses and other authorizations issued pursuant thereto shall be valid within the Sanctuary unless inconsistent with any regulation implementing Article 4. The Sanctuary regulations shall set forth any necessary certification procedures.

Article 6. Alterations to this Designation

This Designation can be altered only in accordance with the same procedures by which it has been made, including public hearings, consultation with interested Federal and State agencies and the Gulf of Mexico Regional Fishery Management Council, and approval by the President of the United States.

Only those activities listed in Article 4 are subject to regulation in the Sanctuary. Before any additional activities may be regulated, the Designation must be amended through the entire designation procedure including public hearing and approval by the President. However, no additional regulation is proposed for two listed activities, spearfishing and navigation, at this time because, despite the potential threat, the need for additional control is not established.

The primary purpose of the proposed regulations is to protect and to preserve the natural state of the banks' ecosystems, particularly the unique coral reefs capping the banks. Accordingly, all activities which would directly destroy or injure corals and other distinctive marine features are prohibited. Such activities include any type of handling, picking or collecting (sec. 934.6(a)(1)), anchoring within the 100 m isobaths except by certain vessels (sec 934.6(a)(2)) and construction or other alterations of the seabed within the 100 m isobaths. (Sec. 934.6(a)(3)). To reduce the possibility of damage to the resources by pollution, all discharges are prohibited except for marine sanitation effluents, vessel cooling waters, fish cleaning wastes and chumming materials, and discharges incidental to certain hydrocarbon operations. (sec. 934.6(a)(5)). All prohibitions must be applied consistently with recognized principles of international law.

All hydrocarbon operations are prohibited within the particularly important hard bank areas to protect the various components of the reef ecosystem. This no activity zone includes primarily the area where such such activities are already prohibited by BLM (within the 85 m isobaths as defined by the quarter-quarter-quarter system (see Appendix A)) but extends to the 100 m isobaths where they are further from the Banks' midpoints. In this area, drilling operations would destroy or injure coral either directly or by pollution.

In the remainder of the sanctuary, hydrocarbon operations under existing leases may continue subject to conditions imposed by other authorities and those conditions designed to minimize pollution listed in sec. 934.7(b) which include requirements that cuttings and adhering drilling muds be shunted to within 6 m of the bottom and that the effects of operations on the banks be monitored. The Environmental Protection Agency (EPA) and NOAA have agreed that these proposed regulations and the conditions of EPA's permits issued under section 402 of the Federal Water Pollution Control Act, 33 U.S.C. 1431, (known as NPDES permits) will correspond to the maximum extent practicable. The appropriate monitoring program will be established in cooperation with the EPA and the precise requirements for any operator established as conditions of its NPDES permits. The conditions of these NPDES permits will also establish the clean up capacity required of any operator. The arrangement between EPA and NOAA is set forth in the Principles of Agreement dated March 13, 1979, Appendix C.

No hydrocarbon exploration and exploitation under leases issued after the effective date of these regulations will be allowed within the Sanctuary for a period of five years to provide an adequate period for the monitoring program to evaluate the effects of operations on the banks.

With limited exceptions, fishing in the waters proposed for the Sanctuary will have not any detrimental effect on the resources of the Sanctuary and its regulation remains the responsibility of the Gulf of Mexico Regional Fishery Management Council and the National Marine Fishery Service pursuant to the Fishery Conservation and Management Act of 1976, 16 U.S.C 1801 et seq. except as specifically set forth in the Designation. (See Article 5, Section 1 of the Designation.) No additional regulation has been proposed by OCZM except for the prohibitition of bottom trawling in the sensitive hard banks area, within the 100m isobaths, (Sec. 934.6(a)(4)), and the taking of coral or tropical fish (Sec. 934.6(a)(1)). Fishing vessels are subject to discharge and anchoring regulations (Sec. 934.6(a)(2) and (a)(5)).

Accordingly, Part 934 is proposed as follows:

PART 934 - FLOWER GARDEN BANKS MARINE SANCTUARY REGULATIONS

Sec.

934.1 Authority.

934.2 Purpose.

934.3 Boundaries.

934.4 Definitions

934.5 Allowed Activities.

934.6. Prohibited Activities.

934.7. Hydrocarbon Operations

934.8. Penalties for Commission of Prohibited Acts.

934.9. Permit Procedures and Criteria.

934.10. Validation of Other Permits.

934.11. Appeals of Administrative Action.

934.1. Authority.

The Sanctuary has been designated by the Secretary of Commerce pursuant to the authority of section 302(a) of Title III of the Marine Protection, Research and Sanctuaries Act of 1972, 16 U.S.C. 1431-1434 (the Act). The following regulations are issued pursuant to the authorities of sections 302(f), 302(g) and 303 of the Act.

934.2. Purpose.

The purpose of designating the East and West Flower Garden Banks as a Marine Sanctuary is to protect and preserve the banks ecosystems in their natural state and to regulate uses within the Sanctuary to insure the health and well-being of the coral and associated flora and fauna and the continued availability of the area as a recreational and research resource.

934.3. Boundaries.

The Sanctuary consists of an area of the Gulf of Mexico located approximately 110 nautical miles (nm) south east of Galveston, Texas, and

120 nm south of Cameron, Louisiana overlaying and surrounding those banks known as the East and West Flower Garden Banks to a distance of 4 nm from the 100 m isobath of each Bank. The coordinates are in Appendix B.

934.4. Definitions.

(a) "Administrator" means the Administrator of the National Oceanic and Atmospheric Administration.

(b) "Assistant Administrator" means the Assistant Administrator for Coastal Zone Management, National Oceanic and Atmospheric Administration.

(c) "Bulk discharge" means a discharge of drill fluids and cuttings other than that of materials separated out by properly operating shale shaker, desander and desilter units; i.e. drill fluids and cuttings contained on the drill facility at the termination of drilling each well hole and drill fluids and cuttings evacuated from the drill fluid system during the course of drilling, for the purpose of reconstituting the operational drill fluid.

(d) "Person" means any private individual, partnership, corporation, or other entity; or any officer, employee, agent, department, agency or instrumentality of the Federal government, or any state or local unit of government.

934.5. Allowed Activities:

All activities except those specifically prohibited by section 934.6 may be carried on in the Sanctuary subject to any prohibitions, restrictions or conditions imposed by any applicable regulations, permit, license, or other authorization.

934.6. Prohibited Activities.

(a) Except as may be immediately and urgently necessary for the protection of life or the environment, or as may be permitted by the Assistant Administrator in accordance with sections 934.9 or 934.10, or as limited by subsection (b), the following activities are prohibited within the Sanctuary:

(1) Removing or damaging distinctive natural features - generally.

(A) No person shall break, cut or similarly damage or destroy any coral or bottom formation, any marine invertebrate or any marine plant. Divers are prohibited from handling coral or standing on coral formations.

(B) No person shall collect or remove any coral or bottom formation, or marine plant. No person shall take, except incidentally to other fishing operations, any marine invertebrate (except for dead shells) nor any tropical fish which is a fish of minimal sport and food value, usually brightly colored, often used for aquaria purposes and which lives in a direct interrelationship with the corals. There shall be a rebuttable presumption that any items listed in this paragraph found in the possession of a person within the Sanctuary have been collected or removed from within the Sanctuary.

(C) No person shall use poisons, electric charges, explosives or similar methods to take any marine animal or plant.

(2) Injurious Vessel Operations.

(A) No vessel except a recreational vessel shall anchor within the area of the Sanctuary defined by the 100m (328 ft.) isobaths.

(B) No person shall place any rope, chain, or anchor in such a way as to injure any coral or other bottom formation anywhere within the Sanctuary. All practicable efforts shall be taken to drop anchors on sand flats off the reefs and place them so as not to drift into the coral formations. When anchoring dive boats, the first diver down shall inspect the anchor to ensure that it is placed off the corals and will not shift in such a way as to damage corals. No further diving is permitted until the anchor is placed in accordance with these requirements.

(C) All vessels from which diving operations are being conducted shall fly in a conspicuous manner the international code flag alpha "A" and no vessel under power shall approach closer than 300 ft. (92 m) to a boat displaying the diving flag except at a maximum speed of 3 knots.

(3) Altering of or construction on the seabed.

No person shall dredge, drill, or otherwise alter the seabed in any way, nor construct any structure except for navigation aids, within the area of the Sanctuary defined by the 100m (328 ft.) isobaths.

(4) Trawling within the 100m isobaths

No person shall trawl or drag bottom gear within the area of the Sanctuary defined by the 100m (328 ft.) isobaths.

(5) Discharging polluting substances.

No person shall deposit or discharge any materials or substances of any kind except

(A) indigenous fish or parts

(B) effluents from marine sanitation devices

(C) non-polluted cooling waters from ocean vessels

(D) effluents incidental to hydrocarbon exploration and exploitation activities as allowed by section 934.7.

(b) The prohibitions in this section are not based on any claim of territoriality and will be applied to foreign persons and vessels only in accordance with recognized principles of international law, including treaties, conventions and other international agreements to which the United States is signatory.

934.7. Hydrocarbon Operations

(a) Within the 85 m isobaths, as defined by the quarter-quarter-quarter system in Appendix A, or within the 100 m (328 ft.) isobaths where such area extends further from the midpoint of either bank (27°55'07.44"N; 93°36'08.49"W for the East Bank and 27°52'14.21"N; 93°48'54.79"W for the West Bank) exploration for or exploitation of hydrocarbons is prohibited.

(b) Outside the area defined by paragraph (a), hydrocarbon exploration and exploitation pursuant to any lease executed prior to the effective date of these regulations is allowed subject to all prohibitions, restrictions and conditions imposed by applicable regulations, permits, licenses or other authorizations including those issued by the Department of the Interior, the Coast Guard, the Corps of Engineers and the Environmental Protection Agency, and subject further to the following:

(i) Cuttings and adherent drilling muds must be shunted to within 6 m of the bottom.

(ii) Bulk discharges of drilling muds are prohibited.

(iii) The simultaneous discharge of the effluents from more than one well from a single rig or platform is prohibited.

(iv) The effects of drill cuttings and effluents upon Sanctuary resources shall be monitored at least once before drilling, frequently during drilling, and at least once after drilling in accordance with the specific requirements set forth in the permits issued by the Environmental Protection Agency pursuant to Section 402 of the Federal Water Pollution Control Act, 33 U.S.C. 1431 in agreement with NOAA.

(c) Hydrocarbon exploration and exploitation activities pursuant to leases executed on or after the effective date of these regulations are prohibited anywhere in the Sanctuary for a period of five years from such effective date.

934.8. Penalties for Commission of Prohibited Acts.

a. Section 303 of the Act authorizes the assessment of a civil penalty of not more than $50,000 against any person subject to the jurisdiction of the United States for each violation of any regulation issued pursuant to the Act, and further authorizes a proceeding in rem against any vessel used in violation of any such regulation. Procedures are set out in Subpart D of Part 922 (15 CFR Part 922) of this chapter. Subpart (D) is applicable to any instance of a violation of these regulations.

934.9. Permit Procedures and Criteria.

a. Any person in possession of a valid permit issued by the Assistant Administrator in accordance with this section may conduct any activity in the Sanctuary including any activity specifically prohibited under section 934.6 if such activity is either (1) research related to the resources of the Sanctuary or (2) to further the educational value of the Sanctuary, or (3) for salvage or recovery operations.

b. Permit applications shall be addressed to the Assistant Administrator for Coastal Zone Management, Attn: Office of Sanctuary Programs, Division of Operations and Enforcement, National Oceanic and Atmospheric Administration 3300 Whitehaven Street, N.W., Washington, D.C. 20235. An application shall provide sufficient information to enable the Assistant Administrator to make the determination called for in paragraph (c) below and shall include a description of all activities proposed, the equipment, methods, and personnel (particularly describing relevant experience) involved, and a timetable for completion of the proposed activity. Copies of all other required licenses or permits shall be attached.

c. In considering whether to grant a permit the Assistant Administrator shall evaluate such matters as (1) the general professional and financial responsibility of the applicant; (2) the appropriateness of the methods envisioned to the purpose(s) of the activity; (3) the extent to which the conduct of any permitted activity may diminish or enhance the value of the Sanctuary as a source of recreation, educational or scientific information; (4) the end value of the activity and (5) such other matters as deemed appropriate.

d. In considering any application submitted pursuant to this Section, the Assistant Administrator may seek and consider the views of any person or entity, within or outside of the Federal Government, and may hold a public hearing, as deemed appropriate.

e. The Assistant Administrator may, in his or her discretion, grant a permit which has been applied for pursuant to this Section, in whole or in part, and subject to such condition(s) as deemed appropriate.

The Assistant Administrator or a designated representative may observe any permitted activity and/or require the submission of one or more reports of the status or progress of such activity any information obtained shall be made available to the public.

f. The permit granted under paragraph (e) may not be transferred.

g. The Assistant Administrator may amend, suspend or revoke a permit granted pursuant to this Section, in whole or in part, temporarily or indefinitely, if the permit holder (the Holder) has acted in violation of the terms of the permit or of the applicable regulations. Any such action shall be in writing to the Holder, and shall set forth the reason(s) for the action taken. The Holder may appeal the action as provided for in 934.11.

934.10. Certification of Other Permits

All permits, licenses and other authorizations issued pursuant to any other authority are hereby certified and shall remain valid if they do not authorize any activity prohibited by section 934.6. Any interested person may request that the Assistant Administrator offer an opinion on whether an activity is prohibited by these regulations.

934.11. Appeals of Administrative Action authorized by an agency.

Any interested person (the Appellant) may appeal the granting, denial or conditioning of any permit under section 934.9 to the Administrator of NOAA. In order to be considered by the Administrator, such appeal shall be in writing, shall state the action(s) appealed and the reason(s) therefore, and shall be submitted within 30 days of the action(s) by the Assistant Administrator. The Appellant may request an informal hearing on the appeal.

b. Upon receipt of an appeal authorized by this Section, the Administrator shall notify the permit applicant, if other than the Appellant and may request such additional information and in such form as will allow action upon the appeal. Upon receipt of sufficient information, the Administrator shall decide the appeal in accordance with the criteria set out in 934.9(c) as appropriate, based upon information relative to the application on file at OCZM and any additional information, the summary record kept of any hearing and the Hearing Officer's recommended decision, if any, as provided in paragraph (c) and such other considerations as deemed appropriate. The Administrator shall notify all interested persons of the decision, and the reason(s) therefore, in writing normally within 30 days of the receipt of sufficient information, unless additional time is needed for a hearing.

c. If a hearing is requested or if the Administrator determines one is appropriate, the Administrator may grant an informal hearing before a Hearing Officer designated for that purpose after first giving notice of the time, place, and subject matter of the hearing in the Federal Register. Such hearing shall normally be held no later than 30 days following publication of the notice in the Federal Register unless the Hearing Officer extends the time for reasons deemed equitable. The Appellant and the Applicant, if different and, at the discretion of the Hearing Officer, other interested persons, may appear personally or by counsel at the hearing and submit such material and present such arguments as determined appropriate by the Hearing Officer. Within 30 days of the last day of the hearing, the Hearing Officer shall recommend in writing a decision to the Administrator.

e. The Administrator may adopt the Hearing Officer's recommended decision, in whole or in part, or may reject or modify it. In any event, the Administrator shall notify interested persons of the decision, and the reason(s) therefor in writing within 30 days of receipt of the recommended decision of the Hearing Officer. The Administrator's action shall constitute final action for the Agency for the purposes of the Administrative Procedure Act.

f. Any time limit prescribed in this Section may be extended for a period not to exceed 30 days by the Administrator for good cause, either upon his or her own motion or upon written request the Appellant or Applicant stating the reason(s) therefor.

Appendix A: Definition of the 85 M Isobaths at East and West Flower Garden Banks From the Bureau of Land Management Lease Stipulations

East Flower Garden Bank:

High Island Area, East Addition, South Extension, Block A-366:

S½SE¼

High Island Area, East Addition, South Extension, Block A-374:

SW¼NW¼NW¼; NW¼SW¼NW¼; S½SW¼NW¼; SW¼NE¼SW¼; W½SW¼; W½SE¼SW¼; SE¼SE¼SW¼

High Island Area, East Addition, South Extension, Block A-375:

E½; SE¼NE¼NW¼; N½SE¼NW¼; SE¼SE¼NW¼; E½SW¼

High Island Area, East Addition, South Extension, Block A-388:

NE¼; NE¼NW¼; N½SE¼NW¼; SE¼SE¼NW¼; N½N½SE¼; S½NW¼SE¼; SW¼NE¼SE¼

High Island Area, East Addition, South Extension, Block A-389:

N½NW¼; SW¼NW¼; N½SE¼NW¼; SW¼SE¼NW¼; N½NW¼SW¼

West Flower Garden Bank:

High Island Area, East Addition, South Extension, Block A-383:

NE¼SE¼SE¼; S½SE¼SE¼

High Island Area, East Addition, South Extension, Block A-384:

NW¼SW¼NE¼; S½S½NE¼; SE¼NW¼; N½NE¼SW¼; NE¼NW¼SW¼; S½N½SW¼; S½SW¼; SE¼

High Island Area, East Addition, South Extension, Block A-397:

W½W½NW¼; W½NW½SW¼; NW¼SW¼SW¼

High Island Area, East Addition, South Extension, Block A-398:

All

High Island Area, East Addition, South Extension, Block A-399:

E½; SE¼NE¼NW¼; E½SE¼NW¼; E½NE¼SW¼; NE¼SE¼SW¼

High Island Area, East-Addition, South Extension, Block A-401:

N½N½NE¼: S½NE¼NE¼; NE¼SE¼NE¼

Garden Banks Area, Block 134:

That portion of the block to the north of the line connecting Points 17 and 18, defined as follows:

Point 17: X=1,378,080.00'; Y=10,096,183.04';

Point 18: X=1,367,079.41'; Y=10,096,183.04';

Universal Transverse Mercator Grid System

Garden Banks Area, Block 135:

That portion of the block to the northwest of the line connecting Points 16 and 17, defined as follows:

Point 16: X=1,383,293.84'; Y=10,103,281.93';

Point 17: X-1,378,080.00'; Y=10,096,183.04';

Universal Transverse Mercator Grid System.

Appendix B: Boundary of the Flower Garden Banks Marine Sanctuary

The Boundary of the Flower Garden Banks Marine Sanctuary is 4 nautical miles from the 100 meter isobath around each Bank. The boundary can be approximated by lines connecting the following points. (See attached map for location of points.)

	Latitude	Longitude
1.	27°46'30.5"N	93°53'31.7"W
2.	27°46'39.6"	93°54'07.9"
3.	27°47'25.1"	93°55'22.0"
4.	27°48'13.2"	93°56'11.6"
5.	27°49'30.3"	93°57'15.5"
6.	27°52'38.7"	93°57'21.9"
7.	27°54'04.1"	93°56'35.2"
8.	27°55'27.4"	93°55'35.6"
9.	27°58'03.0"	93°52'37.9"
10.	27°58'54.6"	93°49'36.7"
11.	27°59'11.1"	93°47'17.3"
12.	27°58'54.4"	93°45'35.3"
13.	27°58'04.8"	93°44'00.6"
14.	27°56'59.6"	93°43'08.0"
15.	28°01'24.8"	93°41'36.4"
16.	28°02'53.1"	93°37'46.3"
17.	28°02'31.6"	93°33'29.8"
18.	28°01'14.2"	93°31'44.2"
19.	28°00'06.4"	93°31'02.6"
20.	27°58'30.0"	93°30'47.1"
21.	27°57'54.6"	93°30'52.2"
22.	27°57'36.6"	93°30'51.4"
23.	27°56'39.7"	93°30'15.4"
24.	27°54'15.3"	93°29'57.2"
25.	27°52'27.8"	93°30'39.2"
26.	27°51'11.2"	93°31'42.0"
27.	27°50'23.5"	93°32'45.2"
28.	27°49'56.1"	93°33'41.1"
29.	27°49'42.3"	93°34'19.5"
30.	27°48'51.1"	93°36'14.5'
31.	27°49'37.2"	93°40'05.6"
32.	27°51'08.7"	93°41'31.1"
33.	27°53'01.1"	93°42'39.0"
34.	27°49'43.0"	93°43'36.8"
35.	27°47'24.4"	93°46'02.5"
36.	27°47'01.3"	93°46'41.4"

Appendix C: NOAA/EPA PRINCIPLES OF AGREEMENT

Coordination of Regulations and Permits for Flower Garden Banks

The following represents a joint statement of policy by the NOAA/EPA Interagency Committee for Program Coordination:

(1) In carrying out their respective responsibilities under Section 402 of the Clean Water Act (CWA) and under Section 302 of the Marine Protection, Research, and Sanctuaries Act (MPRSA), EPA and NOAA agree that, to the maximum extent practicable, they will establish consistent conditions governing oil and gas activities in the proposed Flower Garden Banks Marine Sanctuary (Sanctuary). The conditions agreed upon are attached.

(2) EPA shall issue guidance to the Regional Administrator of Region VI for the development of permit conditions under Section 402 of the CWA for discharges from oil and gas activities within the waters proposed as the Sanctuary, which guidance shall be consisent with the attached conditions to the maximum extent practicable.

(3) NOAA's proposed regulations under Section 302 of the MPRSA relating to discharges from oil and gas activities in the Sanctuary, shall be consistent with the conditions agreed upon with EPA.

James P. Walsh

James P. Walsh
Deputy Administrator
National Oceanic and
Atmospheric Administration

Date 3/14/79

Thomas C. Jorling

Thomas C. Jorling
Assistant Administrator for
Water and Waste Management
Environmental Protection Agency

Date 3/13/79

Flower Garden Marine Sanctuary Regulations and Permit Conditions

A. Sanctuary Boundary: 4 nautical miles from the 100 meter isobaths.

B. No Activity Zone: either: within 85-meter isobaths as defined by quarter-quarter system; or, 100-meter isobaths, whichever is farther from the Banks' midpoints.

C. Conditions for Allowing Operations: No oil or gas operations will be allowed in the sanctuary until a National Pollutant Discharge Elimination System (NPDES) permit has been issued.

1. Shunting of cuttings and adhering drilling muds: to within 6 meters of the seabed within sanctuary defined above.

2. Monitoring: all leases within the sanctuary defined above.

3. Monitoring Requirements: once before, frequently during and once after drilling, with parameters, timing, and other requirements as specified in NPDES permit. Such specifications shall in general be agreed upon by NOAA and EPA.

4. Bulk Discharge of Muds: prohibited within sanctuary defined above.

5. Contingency Plans (for spills of oil and hazardous materials, and for procedures to be followed if Regional Administrator imposes a "no-discharge" permit condition.): required as specified in NPDES permit and sanctuary regulations and agreed upon by NOAA and EPA.

6. Other Discharges - Produced water, Deck drainage, Cooling waters, and Sanitary wastes: in compliance with NPDES permit conditions.

7. Non-Simultaneous Drilling and Discharge (sequential drilling of and discharge from one well at a time from a single platform): required in sanctuary with provision for reconsideration via the conditions of an NPDES permit.

D. Five-Year Moratorium: Five-year moratorium on operations on unsold leases and future leasing within 4 nautical miles of the 100 meter isobaths.

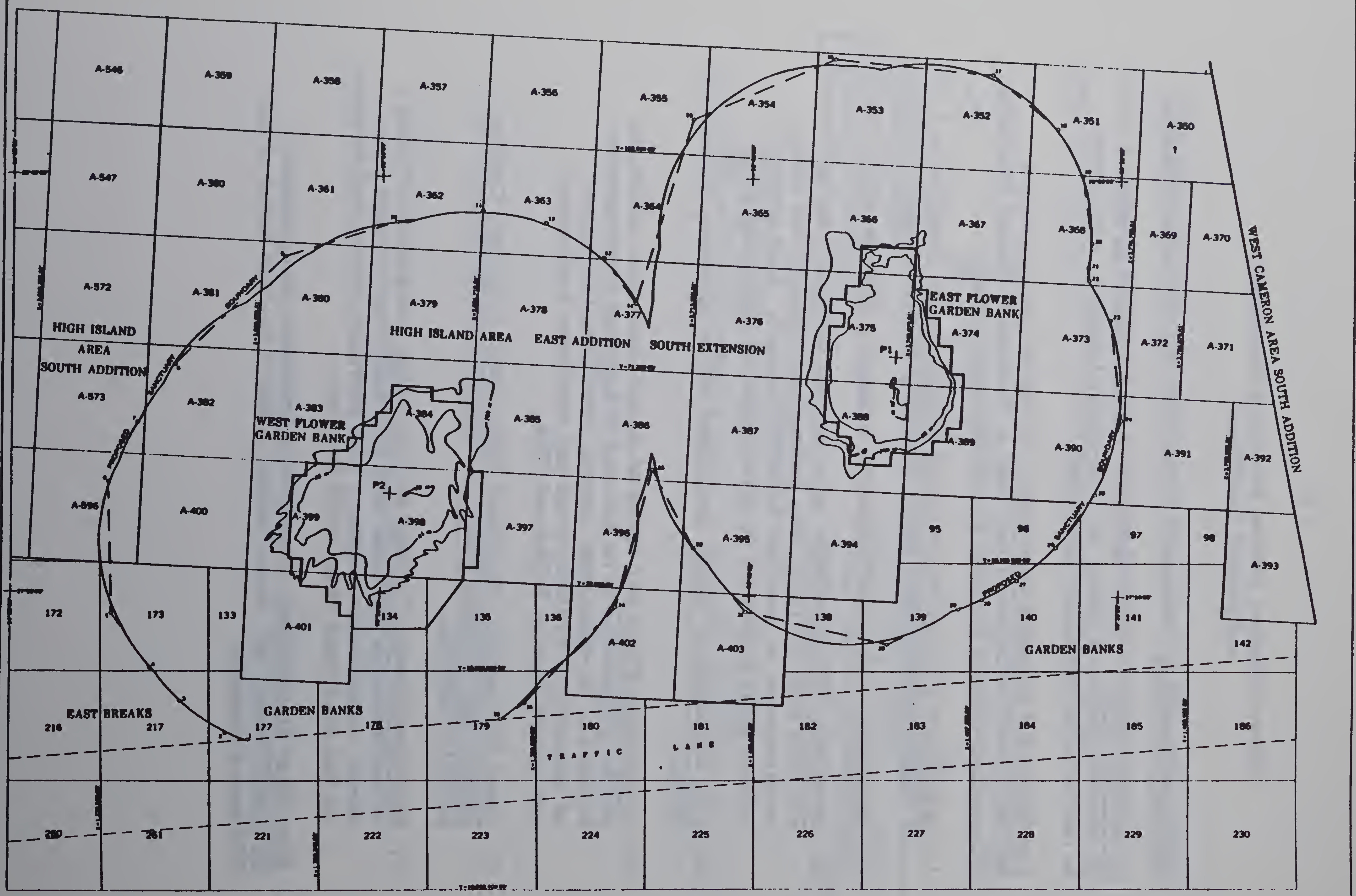

Figure C-1. Proposed boundary of the Flower Garden Banks Marine Sanctuary.

IN REPLY REFER TO
Sale 58A

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

NEW ORLEANS OUTER CONTINENTAL SHELF OFFICE
HALE BOGGS FEDERAL BUILDING
500 CAMP STREET—SUITE 841
NEW ORLEANS, LA. 70130

April 9, 1979

Dr. Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs
U.S. Department of Commerce
Washington, D.C. 20230

Dear Dr. Galler:

This is in reference your comments on our draft environmental impact statement for Proposed OCS Oil and Gas Lease Sale No. 58A.

Unfortunately, your comments were received after the impact statement left our office. Corrections and minor changes can still be made in our Washington Office; however, due to time constraints, the figure you provided and the additional discussions you requested cannot be incorporated into the text at this time. They will, however, be addressed in the appendix with the comments and the changes will be incorporated into the text of the draft environmental impact statement for our next proposed OCS oil and gas lease sale in the Gulf of Mexico (Sale No. 62).

The following is a list of our responses to your comments:

Enclosure from OA/Cx1 - Gordon Lill - NOS

Comment: P. 24 - The table attributed to NOS, the sea level change of 0.16 m in 47 years is incorrect. It should be 0.13 m in 47 years.
Response: The change has been made.

Comment: The second station, Lake Charles, La., was reported in operation for 31 years. That was incorrect. It was in operation for only 21 months, from March 1932 to November 1933.
Response: Lake Charles has been deleted from the table.

Comment: The Galveston Pier 21 station reported a sea level change of 0.43 m in 62 years. The figure should be 0.39 m.
Response: The change has been made.

Comment: Figure II-16 on page 48 is incorrect.
Response: In future Gulf of Mexico impact statements, the figure supplied will be substituted for the one in the DEIS for proposed Sale 58A.

Enclosure from George C. Steinman, Maritime Administration

Comment: Table II-9 showing magnitude of waterborne traffic at major Gulf ports is not the most recent available.
Response: The data for 1977 will be added in our next environmental impact statement. The updated table is attached.

Comment: In the discussion of Seadock, it should be noted that the project has been officially "adopted" by the state of Texas.
Response: This has been added to the discussion.

Comment: The Port and Tanker Safety Act of 1978 (P.L. 95-474) should be added to the discussion of national laws used by the Coast Guard to decrease the amount of oil introduced into the marine environment.
Response: This Act has been added to the discussion for future statements.

Comment: A number of blocks are located partially or wholly within fairway or anchorage areas. If the resources are to be reached through directional drilling, it should be closely stated in the text.
Response: This statement has been added to the text.

Comment: Apparently there is no restriction on placement of rigs and platforms within anchorage areas, a practice which will reduce the availability of vessel anchorages unless alternate areas are provided. This impact is apparently not addressed.
Response: The Army Corps of Engineers, under Title 33 paragraph 209.135, entitled "Navigation and Navigable Waters, Shipping Safety Fairways and Anchorages, Gulf of Mexico" restricts structures or drilling complexes by requiring a minimum distance of 2 miles between the outermost limits of such structures or drilling complexes. According to the Permits Branch of the New Orleans District, COE, it is extremely rare for a firm to apply for a permit to place a structure or rig in an anchorage area. Therefore, it is felt that the practive of siting structures or drilling complexes in anchorage areas will not significantly reduce the availability of vessel anchorages. The discussion will be added to future impact statements.

Enclosure from Richard Hoogland for William Stevenson, Regional Director, NMFS

Comment: The proposed action would significantly affect the resources for which the NMFS is responsible. Therefore, all the resources information provided in the June 30, 1978 letter to BLM from Sam Bleicher, Director, Office of Ocean Management, should be included in the FEIS.
Response: Much of the information provided in the subject letter (attached) was used, where applicable, in various parts of the impact statement. The NOAA White Paper on the Flower Gardens Marine Sanctuary is, as we understand it, out of date and an EIS is forth-

coming. This document will be referenced in our future EIS's. The White Paper and other documents referred to are too voluminous to reproduce intact in the FEIS; however, the pertinent information has been utilized.

Comment: The humpback whale should be included in the section on threatened and endangered species since it is listed in Appendix H.

Response: The humpback whale usually does not occur within the area of this proposal, although it may occur in the eastern Gulf of Mexico along the shelf slope. Therefore, impact from the proposed action should be minimal.
Table H-2 has been deleted from FEIS 58A.

Comment: The humpback whale should be included in the discussion of Impact on Marine Mammals.

Response: The humpback whale, as well as several other species of endangered mammals, was included in the general discussion of impacts to endangered marine mammals.

Comment: The bottlenosed dolphin (Tursiops truncatus) is a common inshore species. Since it feeds in shallow bays at high tide, it is susceptible to oil spills. This should be discussed in more detail.

Response: This information will be incorporated into future EIS's.

Comment: The hawksbill sea turtle, which is included in II.B.9., should be discussed in the section on Impacts on Marine Turtles.

Response: The hawksbill marine turtle usually does not occur within the area of the this proposal, although it may forage in the southern portions of the Gulf of Mexico.

Comment: The Impacts on Commercial Fisheries section should include a more detailed discussion of pipeline installation and potential impacts on the commercial trawl fisheries when pipelines are installed on the seafloor.

Response: Pipelines, typically, are installed by lay barge or reel barge and buried by jetting in water depths less than 200 feet. During construction, the barges use a number of anchors to maintain position and to move ahead as the line is constructed. Generally, two are placed in front, two in back and two anchors are placed to each side. The length of cable to each anchor is dependent on water depth, but may be up to several thousand feet in deeper water. In a "worst-case" situation, as much as 1650 acres of seafloor might be temporarily inaccessible for trawling during a pipe laying operation. If good seamanship is observed, there should be little conflict with trawl fisheries.

Comment: The scientific name for the short-finned pilot whale should be G. macrorhynchus, not G. macrorhyncha.

Response: The correction has been made.

We trust that these responses adequately address your concerns. Thank you for your input.

If you have any further questions or comments, please let us know.

Sincerely,

H. P. Sieverding
Acting Manager

March 3, 1849

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

NEW ORLEANS OUTER CONTINENTAL SHELF OFFICE
HALE BOGGS FEDERAL BUILDING
500 CAMP STREET—SUITE 841
NEW ORLEANS, LA. 70130

IN REPLY REFER TO
Sale 58 A

April 10, 1979

Dr. Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs
U.S. Department of Commerce
Washington, D.C. 20230

Dear Dr. Galler:

Thank you for your comments on the DEIS for proposed OCS Sale 58A. Unfortunately, their late arrival limits the attention we can devote to them in the FEIS.

We do note that they are not substantially different from the postion the NOAA OCZM staff developed. Since there was a great deal of consultation between OCZM and staff members of this office, we were disappointed that OCZM did not accept Interior's recommendations regarding the proposed sanctuary, despite the wealth of information that was provided OCZM and their contractor (Center for Natural Areas), and despite preliminary indications that Interior's position had in large measure been accepted.

Your letter stated "...in the absence of more data, it is impossible to insure that the reefs and hard bank biota will not be harmed by oil and gas operations." The Bureau of Land Management has historically been the federal agency most active and most concerned with protection of the Flower Garden Banks and other biologically sensitive areas in the Gulf of Mexico. This office has expended considerable effort over the past six years working with other federal, state, and university experts to design, implement and evaluate protective stipulations and effective research to map and characterize the location, extent, and health of the coral reefs and associated marine biota of the Flower Garden Banks and other such areas. One of the main contributors to the research has been Texas A&M University through contracts with BLM.

Information from reefal studies at these banks and elsewhere in the Gulf has given us sufficient experience to impose operational restrictions to successfully protect these hard banks and their associated communities. It is clear that the preponderance of the evidence supports our contention that oil and gas operations can be conducted as we propose, with effective restrictions imposed, without harming the high value reefal communities of the area. It should be noted that there are currently some 40 active leases in the area (Figure A).

A comparison between NOAA's proposed marine sanctuary restrictions (Figure B) and the Department of Interior's proposed lease stipulations indicates small differences for the tract tentatively to be offered in proposed sale 58A, Block A-374 of High Island Area, East Addition, South Extension. NOAA has chosen the 100 meter contour, when it falls outside Interior's restrictive zone, for no oil and gas activity. The 100 meter contour falls outside Interior's restrictive zone only in the NW¼NW¼NW¼ of this block. Interior's stipulations call for shunting and monitoring in the drillable portions of the block similar to NOAA's proposed restrictions, except that under our stipulations monitoring would not be required in as extensive an area as NOAA would require. Thus it appears that we agree that sensible and workable systems are presently in place to allow oil and gas development to safely co-exist in this block.

We are most interested in working with you, EPA, the industry, and others in developing and implementing future studies and monitoring in the Flower Gardens area.

Sincerely,

John L. Rankin
Manager

Enclosure

cc: Robert Kifer

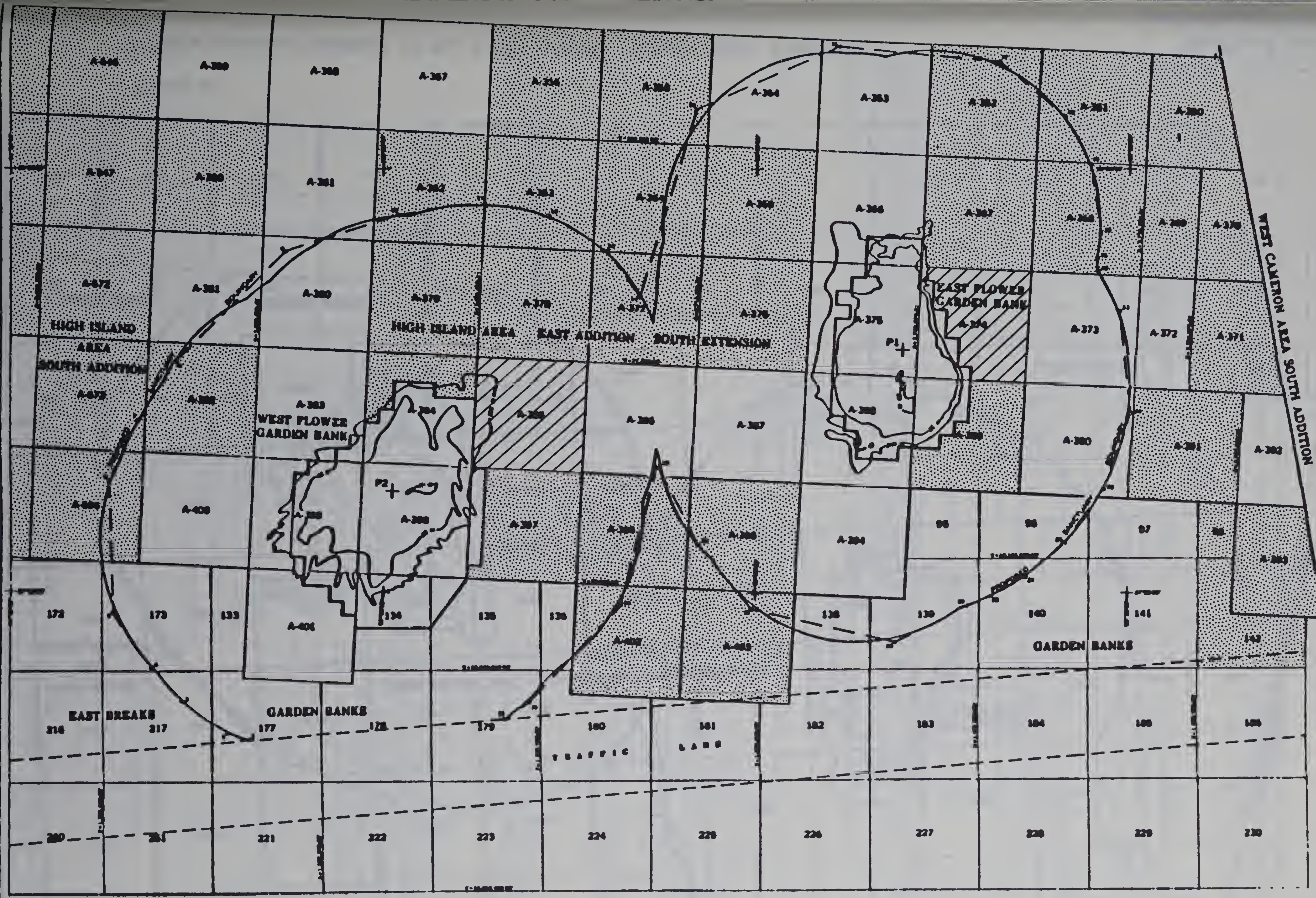

Figure A.

NOAA's proposed boundary of the Flower Garden Banks Marine Sanctuary showing the locations of 40 leases in the area and Blocks A-374 & A-385 proposed for Sale 58A.

EAST AND WEST FLOWER GARDEN BANK AREAS
PROTECTIVE RESTRICTIONS BOUNDARIES
SCALE 1" = [illegible]

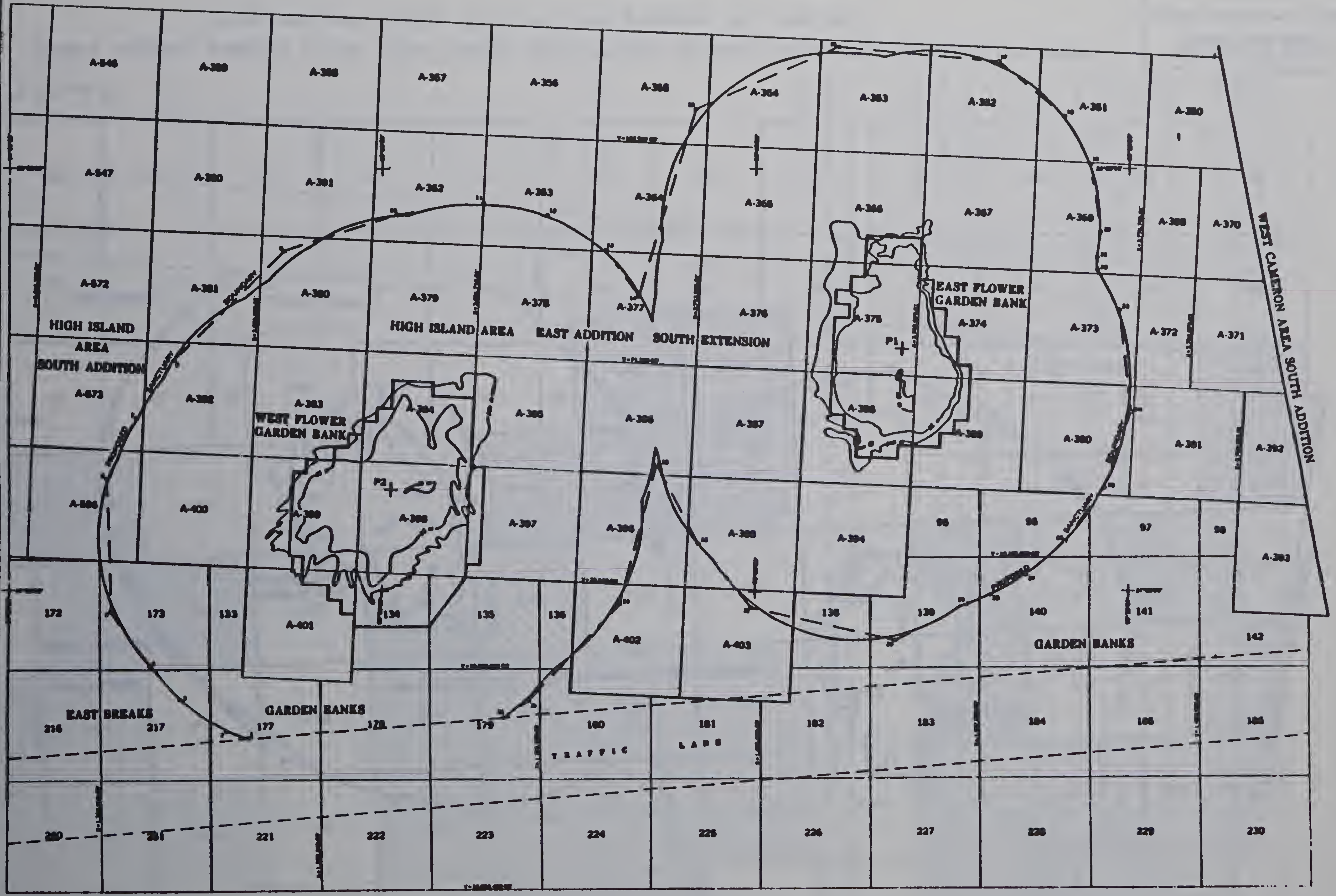

Figure B.

NOAA's proposed boundary of the Flower Garden Banks Marine Sanctuary.

RESPONSE TO COMMENTS BY DEPARTMENT OF COMMERCE

1. Inaccuracies concerning the proposed Flower Garden Banks Marine Sanctuary pointed out by OCZM comments, and technical inaccuracies identified in other Department of Commerce agency comments, have been corrected in the text as appropriate.

The following responds to additional comments of OCZM:

2. OCZM strongly recommends deleting tract 58A-115. While BLM continues to believe that Bureau and Department of Interior regulations, and proposed stipulations, provide adequate protection to the Flower Garden Banks, deletion of tract 58A-115 has been included in an alternative for Secretarial decision.

3. NOAA and EPA propose a five-year moratorium on new leasing and issuance of NPDES permits within the proposed sanctuary. BLM is concerned that such a moratorium would prevent potential production in the area, inconsistent with the national goal of increased oil and gas production. Based on the five years of studies sponsored by BLM, the Bureau does not believe that additional studies conducted during a moratorium are required to assure protection of the banks.

4. OCZM asked for a summary of how BLM stipulations would compare with proposed marine sanctuary regulations and EPA proposed NPDES permit conditions. The following summary is adopted from OCZM's Draft Environmental Impact Statement prepared on the Proposed East and West Flower Gardens Marine Sanctuary.

	BLM/DOI	NOAA/EPA
a. No activity zone	85 m isobath defined by aliquot description	Existing leases 85 m isobath, defined by aliquot description or 100 m isobath, whichever is further from bank mid-point. New leases: During 5-year moratorium--entire sanctuary (within 4 nm of 100 m isobath)
b. Shunting	Within 3 nm of 85 m isobath to within 10 m of bottom	Within entire sanctuary to within 6 m of bottom
c. Monitoring	Within 1 nm of 85 m isobath once before, periodically during, and once after	Within entire sanctuary, timed similar to BLM requirement but timing specified in NPDES permit
d. Other discharges	No garbage, untreated sewage or solid waste disposed of from vessels within 3 nm of 85 m isobath. All drilling discharges through shunt pipes.	Deck drainage, cooling waters and sanitory waste in compliance with NPDES permit. Discharge from only one well at a time required, but with waiver provision. No bulk discharge of muds within entire sanctuary.
e. Toxic bactericides	Prohibited within 3 nm of 85 m isobath by Stip. 2; prohibited in all 58A leases by Stipulation 3	Prohibited in entire sanctuary.
f. Contingency plans	Oil spills	Oil spills and if no discharge condition imposed.
g. Moratorium	No oil and gas operations within 85 m isobath, defined by aliquot description	No oil and gas exploration or exploitation activity in sanctuary for new leases (after sanctuary regulations effective) for five years.

RESPONSE TO COMMENTS BY U.S. GEOLOGICAL SURVEY

Considerable corrections were incorporated in the statement in response to inaccuracies by the USGS comments. Editorial comments were used to improve the final statement. In some cases, updated data were not able to be incorporated, due to lack of time, but will be used in future environmental statements.

Glossary

ABYSSAL	oceanic depths below 1,829 m
ADVECTION	horizontal, large-scale movement of an air mass that causes changes in temperature or other physical properties of the air
AERATE	supply or charge with air
ANOMALY	deviation from unifomity
ANTICLINE	a fold in which the strata dip in opposite directions away from the plane of the axis; the shape of an inverted "u"
AQUIFER	stratum or zone below the surface of the earth capable of producing water
ARTESIAN	ground water under sufficient hydrostatic pressure to rise above the aquifer containing it
ASSEMBLAGE	a collection of plants, animals, or objects
BATHYMETRIC	the measurement of depths; usually applied to the ocean
BENTHIC	bottom living organisms from the shoreline to the greatest depths of the ocean
BIOGENIC	a deposit resulting from the physiological activities of living organisms
BLOCK	an area on the OCS derived from surveying techniques used to provide legal definition of property; similar to the township and range system on land
BLOWOUT	in drilling a well by the rotary method, an unexpected pressure of gas or oil "blows" the mud-laden drilling fluid from the hole ending drilling until controlled
BLOWOUT PREVENTER	a device attached immediately above the casing to control pressures and prevent escape of fluids from the annular space between the drill pipe and casing or shut off the hole if no drill pipe is in the hole, should a kick or blowout occur

BRACKISH	waters with a saline content between fresh and sea water (15-30 ppt)
CATENARY	the curve assumed by a flexible cord of uniform density and cross section hanging freely from two fixed points
CENOZOIC	the latest of the four eras into which geologic time, as recorded by the stratified rock of the earth's crust, is divided; extends from the close of the Mesozoic era to the present; 63,000,000 years ago to present.
CETACEAN	the order Cetacea, which includes fishlike aquatic mammals such as whales and porpoises
CHRISTMAS TREE	a term applied to the valves and fittings at the top of a well to control the flow of oil or gas
CLASTIC	fragments of rock or organic structures that have been moved individually from their place or origin
COCCOLITHOPHORID	very thin calcareous plates surfacing some marine flagellate organisms
CONTINENTAL SHELF	shallow, gently sloping submerged marginal zone of the continents extending from the shore to an abrupt increase in slope; greatest average depth less than 600 ft., slope generally less than 1 to 1,000, local relief less than 60 ft., width ranging from very narrow to more than 200 mi.
CONTINENTAL SLOPE	continual sloping portion of the continental margin with gradient of more than 1 to 40, beginning at the outer edge of the continental shelf and extending to a rather abrupt decrease in slope where the continental rise begins at depths ranging from about 4,500-10,000 ft.
CONVECTION	vertical, mixing movement of an air mass due to different temperatures and densities

COPEPOD	the subclass Copepoda; a minute crustacean without any distinct sort of hard, protective outer covering; none known as fossils
CROWN BLOCK	the large assembly of pulleys or sheaves located at the top of the derrick on a drill rig through which drilling cables are reaved
CRUSTACEA	the class of Arthropods; with two pairs of antennae and generally some appendages with two branches
CUMULUS	a dense, white, fluffy, flat-based cloud with a multiple rounded top and well defined outline, usually formed by the ascent of thermally unstable air masses (convection)
CUTTINGS	fragmented rock samples broken or torn from the penetrated rock during drilling
DEMERSAL	fish and other free swimming animals that live on or adjacent to the seabottom and feed on bottom living or benthic organisms
DEPOCENTER	an area of maximum deposition
DETRITUS	material produced by the disintegration and weathering of rocks or plant and organic matter that have been moved from their site of origin
DIAPIR	an anticlinal fold in which a mobile core has broken through brittle overlying rocks
DIATOM	microscopic, single-celled plant growing in marine, brackish, or fresh water; secrete siliceous frustules (2-valved shell) in a great variety of forms that may accumulate in sediments in enormous numbers
DINOFLAGELLATE	minute, chiefly marine protozoa of the class Dinoflagellata; one of the chief constituents of plankton characteristically having two flagella and a cellulose outer envelope
DOME	a roughly symmetrical upfold with the beds dipping in all directions, more or less equally, from a point; the shape of an inverted bowl

DRIVE PIPE	a pipe which is driven or forced into a bored hole to shut off water or prevent caving
DUGONG	genus of mammals in the order Sirenia; similar to the manatee although the tail is cleft, flippers are without nails and males have two large tusks
DYNAMIC POSITIONING	a method of station keeping utilizing a computer to control propellers or thrusters to keep the vessel over one particular spot
EGRESSES	an exit
ESTUARY	drainage channel adjacent to the sea in which the tide ebbs and flows. Some estuaries are the lower courses of rivers or smaller streams, others are no more than drainage ways that lead seawater into and out of coastal swamps
FACIES	general appearance or nature of one part of a rock body as contrasted with other parts
FORAMINIFERA	subclass of the Sarcondina; unicellular mostly marine animals of microscopic size that secrete tests (shells) composed of calcium carbonate (limestone) or cemented sedimentary grains consisting of one to many chambers arranged in a great variety of ways
FORMATION WATER	groundwater naturally occurring in sedimentary strata
GRAVITY	in geophysical surveys measurement of the force that tends to pull bodies toward the center of the earth and gives them weight
HOLOCENE	recent geologic time
HURRICANE	a tropical cyclone with sustained surface wind speeds of 64 knots (74 mph) or more
JURASSIC	the middle of three periods in the Mesozoic era (230 million to 180 million years ago)

LITHOFACIES	the rock record of any sedimentary environment, including both physical and organic characters
MAGNETICS	in geophysical surveys, measurement of the magnetic field of the earth at a given point
MANATEE	common American sea cow (order Sirenia), sluggish ponderous animal without hind limbs, tail rounded and flattened, to 15 ft in length
MIOCENE	the fourth of five epochs into which the Tertiary period is divided (25 million to 13 million years ago)
MUDS	various fluids and emulsions used in rotary drilling
NEKTON	marine animals that can direct their own movements against currents at or near the surface
NERITIC	marine area extending from the shoreline to the edge of the continental shelf
NEPHELOID LAYER	a zone of water consisting of a suspension of fine organic matter and clay-sized particles; the thickness of this layer varies depending on the season and other factors, but its presence is apparently found throughout the world's oceans
OLIGOCENE	the third of the epochs into which the Tertiary period is divided (36 to 25 million years ago)
OSCILLATE	to move or swing backward and forward (vibrate)
PARALIC	pertaining to environments of the marine borders, such as lagoons, beach, and shallow nearshore
PELAGIC	pertaining to communities of marine organisms which live free from direct dependence on bottom or shore; the two types are free-swimming (nektonic) and floating (planktonic)

PHYLUM	one of the primary divisions of the animal and plant kingdom; a group of closely related classes of animals or plants
PHYTOPLANKTON	floating plants such as diatoms, dinoflagellates, coccolithophores, and sargassum weed
PIERCEMENT DOME	a dome in which the core has broken through the overlying strata until it reaches or approaches the surface, usually composed of salt or shale
PINNIPED	suborder of gregarious carnivorous mammals, including the seals, sea lions, and walruses
PLEISTOCENE	the earlier of the two epochs in the Quarternary period approximately 2.5 million to 6,000 years before present
PLIOCENE	the latest of the epochs in the Tertiary period (approximately 13 million to 2.5 millions years before present)
PROGRADATION	seaward advance of the shoreline resulting from nearshore deposition of sediments brought to the sea by rivers
QUARTERNARY	the younger of the two geologic periods in the Cenozoic era which includes the Pleistocene and Holocene (2.5 million years to present)
REGRESSION	gradual contraction of a shallow sea resulting in the emergence of land as when sea level falls or land rises
RESERVOIR	a porous formation forming a natural underground container of liquids, such as oil, water, or gas
RISER	a pipe through which the drilling takes place or through which the production moves upward
SCARP	an escarpment, cliff, or steep slope of some extent along the margin of a plateau, mesa, terrace, or bench

SEISMIC REFLECTION	in geophysical surveys, measurement of the deep rock strata in which a portion of the sound energy is turned back into the medium through which it approached
SEISMIC REFRACTION	in geophysical surveys, measurement of the shallow rock strata in which the direction of sound energy is changed as a result of a change in density within the medium
STRATIGRAPHIC CORRELATION	in geophysical surveys, determination of geologic age and stratigraphic position of two formations or other stratigraphic units in separate areas
SWELL	a low dome or anticline of considerable areal extent
SYNOPTIC	atmospheric conditions existing at a given time over an extended region
TECTONIC	rock structure and external forms resulting from the deformation of the earth's crust
TERTIARY	the earlier of the two geologic periods in the Cenozoic era (63 million to 2.5 million years before present)
THERMOCLINE	a vertical, negative temperature gradient in some layer of water which is appreciably greater than the gradients above and below it
TRACT	a particular block identified for proposed minerals leasing through the OCS lease sale program
TRANSGRESSION	gradual expansion of a shallow sea resulting in the submergence of land as when sea level rises or land subsides
TRAVELING BLOCK	the assembly of pulleys or sheaves which is hoisted or lowered in the derrick by the drilling cables
TROPICAL CYCLONE	any closed atmospheric circulation developing over tropical oceanic regions in which winds move counter-clockwise around a center of low pressure

TROPICAL STORM	tropical cyclone with closed isobars and sustained surface wind speeds of 34 to 63 knots (39-73 mph)
TROUGH	an elongated, wide depression with gently sloping borders
TURBIDITE	deposit created by a turbidity current
TURBIDITY CURRENT	current which flows down a slope; caused by an increase in density of a body of water by mixed sediments
ZIRCONIUM	a lustrous, grayish-white, strong, ductile metallic element obtained primarily from zircon; used chiefly in ceramic and refractory compounds, as an alloying agent, in nuclear reactors, and prosthesis
ZOOPLANKTON	animals suspended in the water dependent upon currents and water movements for motion

Abbreviations

ABBREVIATIONS

A.D.	anno Domini, "in the year of the Lord"
Ba	barium
BLM	Bureau of Land Management
BP	before present
C	carbon
Cd	cadmium
CEI	Coastal Environments, Inc.
CEQ	Council of Environmental Quality
Cr	chromium
Cu	copper
CZMA	Coastal Zone Management Act
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
EPA	U.S. Environmental Protection Agency
ES	Enviromental Statement
ESCAROSA	Escambia, Santa Rosa
FCMA	Fishery Conservation and Management Act
Fe	Iron
F.O.B.	free-on-board
FR	Federal Register
FWPCA	Federal Water Pollution Control Act
GS	U.S. Geological Survey
GSA	General Services Administration
I	Interstate Highway System
ICC	Interstate Commerce Commission
LOOP	Louisiana Offshore Oil Port, Inc.
LWCF	Land and Water Conservation Fund
MAFLA	Mississippi, Alabama, Florida
Mg	magnesium
MOU	Memorandum of Understanding
NAS	National Academy of Sciences
NEPA	National Environmental Policy Act
Ni	Nickel
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Survey
NPDES	National Pollutant Discharge Elimination System
OCS	Outer Continental Shelf
Pb	lead
pH	expression of alkalinity/acidity
PHC	petroleum hydrocarbons
PL	public law
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SCUBA	Self Contained Underwater Breathing Apparatus
SIC	Standard Industrial Classification
SUSIO	State University System Institute of Oceanography

USDC	U.S. Department of Commerce
USFWS	U.S. Fish and Wildlife Service
V	vanadium
WWII	World War Two
Zn	zinc

Units Of Measure

ac	acre
bpd	barrels per day
C	Celsius
cm	centimeter
o	degree
F	Fahrenheit
ft/century	feet per century
ha	hectare
Khz	kilohertz
km	kilometer
km^2	square kilometer
km/hr	kilometer per hour
kn	knot
l	liter
m	meter
m^3	cubic meter
mi	mile
mmb	million barrels
mmcfd	million cubic feet per day
mmmcf	billion cubic feet
mph	miles per hour
nmi	nautical mile
nmi^2	square nautical mile
ppm	parts per million
ppt	parts per thousand
t	ton
ug/l	micrograms per liter

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